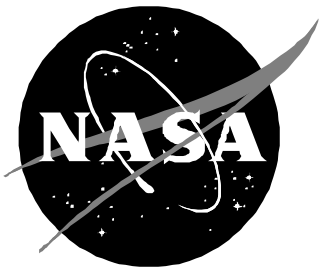

August 6 , 1999
AMENDED DATE – August 20, 1999
AO 99-OSS-03

National Aeronautics
And Space Administration

Announcement of Opportunity

Gamma-Ray Large Area Space Telescope (GLAST)

Flight Investigations

Notice of Intent Due: September 21, 1999 **Proposals Due: October 21, 1999**

AMENDED DATES

Notice of Intent Due: October 4, 1999 **Proposals Due: November 4, 1999**

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APPENDICES

1.0 DESCRIPTION OF THE OPPORTUNITY

1.1 Overall Description

The National Aeronautics and Space Administration (NASA) is planning a new space mission, called the Gamma Ray Large Area Space Telescope (GLAST), for observing high-energy gamma rays from celestial gamma-ray sources. A high-energy gamma-ray mission is identified in the Strategic Plan of the NASA Office of Space Science (OSS) and is one of the highest recommendations of the Gamma Ray Program Working Group, the Structure and Evolution of the Universe Subcommittee, and the Space Science Advisory Committee.

The GLAST mission is planned as part of NASA's overall program in Space Science. The GLAST mission is scheduled for an Independent Assessment in 2000 and a Nonadvocate Review in 2001. It is anticipated that this will result in new start authority in Fiscal Year 2002. GLAST is planned for launch on an expendable launch vehicle in 2005, and it is expected to have a baseline lifetime of five years, with the possibility of an additional five year extended mission.

This Announcement of Opportunity (AO) from NASA is for scientific investigations using GLAST. Investigations for which the development of flight instrumentation is proposed (Instrument Principal Investigator proposals), as well as those for which it is not (Interdisciplinary Scientist proposals), are solicited. This solicitation is open to all categories of organizations, domestic and foreign, including educational organizations, industry, nonprofit organizations, NASA Centers, and other Government agencies.

GLAST will identify and study nature's high-energy particle accelerators through observations of active galactic nuclei, pulsars, stellar-mass black holes, supernova remnants, gamma-ray bursts, and diffuse galactic and extragalactic high-energy radiation in the energy range from 20 MeV to 300 GeV and higher. GLAST will use these sources to probe important physical parameters of the Galaxy and the Universe that are not readily measured with other observations. The high-energy gamma rays will be used to search for a variety of fundamentally new phenomena, such as particle dark matter and evaporating black holes.

The GLAST mission's scientific objectives require an instrument with large collecting area, imaging capability over a wide field of view, the ability to measure the energy of gamma rays over a broad energy range, and time resolution sufficient to study transient phenomena. The instrument must also achieve sufficient background discrimination against the large fluxes of cosmic rays, Earth albedo gamma rays, and trapped radiation that are encountered in orbit.

GLAST will be a Facility Class astronomical observatory, and additional research opportunities using GLAST will be made available to the scientific community through future solicitations.

1.2 NASA Resources Available for GLAST Flight Investigations

GLAST is cost constrained, and cost will be an important criterion in the selection of scientific investigations and flight instrumentation. NASA currently has budgeted a maximum of $73.7M, including reserves, through FY 2005 for the formulation (Phase A/B) and implementation (Phase C/D) activities, through delivery, launch, and orbital verification, for all investigations selected under this AO. NASA currently has budgeted a maximum of $12.9M for mission operations and data analysis (Phase E) activities, allocated over the five year lifetime of the GLAST mission, for all investigations selected under this AO. The spending profiles are given in Section 4.6.1.

This funding is contingent upon NASA receiving the requested appropriations and upon NASA receiving appropriate proposals in response to this AO.

GLAST is currently in Phase A (Concept Study) and is in the NASA strategic plan for a new start in Fiscal Year 2002. However, since it is not a Congressionally approved program, this AO does not constitute an obligation on the part of the Government to carry to completion efforts selected in response to this AO.

1.3 Specific Provisions

This AO solicits proposals for scientific investigations requiring GLAST. Instrument Principal Investigator (IPI) proposals involve investigations in which development of flight instrumentation is included as part of the proposed scientific investigation. Interdisciplinary Scientist (IDS) proposals involve investigations for which no flight instrumentation is proposed for development.

GLAST will contain a Large Area Telescope (LAT) that will be capable of fulfilling the science objectives listed in the *GLAST Science Requirements Document* (see Appendix C). This AO solicits proposals for scientific investigations in which development of a Large Area Telescope is included as part of the proposed scientific investigation. An important criterion in the selection of this telescope will be the ability of the proposed design to meet or exceed the primary instrument measurement requirements given in the *GLAST Science Requirements Document* and in Section 4.2.1. NASA intends to select a single Large Area Telescope for GLAST.

The GLAST Facility Science Team has suggested that a Gamma-ray Burst Monitor on the GLAST spacecraft would enhance the science return from the GLAST mission. Therefore, this AO solicits proposals for scientific investigations in which development of a Gamma-ray Burst Monitor is included as part of the proposed scientific investigation. This may be a proposal separate from a Large Area Telescope proposal, or a combined proposal. An important criterion in the selection of this instrument will be the ability of the proposed design to meet the

instrument measurement requirements for a burst monitor specified in the *GLAST Science Requirements Document* and in Section 4.2.2. NASA reserves the right not to select any Gamma-ray Burst Monitor for programmatic, budgetary, and/or scientific reasons. The LAT needs shall take precedence in the competition for resources. Secondary instruments must complement and enhance the return from the LAT.

There may also be secondary science instruments other than a Gamma-ray Burst Monitor that would enhance the scientific return from the GLAST mission. This AO solicits proposals in which development of a secondary science instrument is included as part of the proposed scientific investigation. This may be a proposal separate from a Large Area Telescope proposal, or a combined proposal. An important criterion in the selection of such an instrument will be the capability of the proposed design to enhance the ability of GLAST to meet the science objectives stated in the *GLAST Science Requirements Document*. NASA reserves the right not to select any secondary science instrument for any reason, including programmatic, budgetary, and/or scientific.

Proposals for scientific investigations that do not involve the development of flight instrumentation (Interdisciplinary Science investigations) are also solicited with this AO. Science investigations of this type should assume the availability of a Large Area Telescope meeting the primary instrument measurement requirements specified in the *GLAST Science Requirements Document*. An important criterion in the selection of these investigations will be their relevance to the science objectives discussed in the *GLAST Science Requirements Document*.

GLAST is also expected to involve a Guest Investigator program, including a Key Project program. A NASA Research Announcement soliciting proposals for guest investigations using the GLAST instrument complement will be issued at a later date, nominally within one year of the GLAST launch date.

Proposers are encouraged to seek supplemental funding or contributions from sources other than NASA. Contributions could come through collaborations with non-U.S. scientists and their funding agencies; contributions from other Government agencies; or donations from foundations, industry, or individuals and institutions in the private sector.

Proposals will be evaluated by a scientific peer panel and by a technical and programmatic review panel. Proposals will be examined to ensure that they conform to the requirements and constraints in Section 4, including the detailed funding schedules, and they will be evaluated for cost and technical feasibility as described in Section 6. The winning proposal(s) will be selected for a formulation phase followed by confirmation for development for flight. A peer review panel may be used to assist NASA in the confirmation process.

1.4 Proposal Opportunity Schedule

The schedule of events associated with this Announcement of Opportunity is as follows. All dates beyond the deadline for nondomestic letters of endorsement are targets.

Release draft AO .....February 1, 1999
Comments on Draft AO due .....March 1, 1999
Release AO.....August 6, 1999
Amended Issue Date……August 20, 1999
Notice of Intent to propose due (see Section 5.1.3).....September 21, 1999
Amended Notice of Intent ……..October 4, 1999
Proposal due by 4 p.m. (Eastern Time) .....October 21, 1999
Amended Proposal Due Date……..November 4, 1999
Non-U.S. Letters of Endorsement Due .....November 19, 1999
Selection of Investigations .....February 1, 2000
Award of Contracts .....April 1, 2000

2.0 ANNOUNCEMENT OBJECTIVES

2.1 Scientific Objectives of the Gamma Ray Large Area Space Telescope

High-energy gamma-ray astronomy is currently in a period of discovery and vigor unparalleled in its history. In particular, the Energetic Gamma Ray Experiment Telescope (EGRET) on the Compton Gamma Ray Observatory (CGRO) has moved the field from a few detections of a small number of sources to detailed studies of several classes of galactic and extragalactic objects. The EGRET discoveries of gamma-ray blazars, pulsars, high-energy gamma-ray bursts, and a large class of unidentified high-energy sources have provided a new view of the high-energy gamma-ray sky while raising fundamental new questions about the origin, evolution, and destiny of nature's highest energy sources of radiation.

High-energy gamma rays probe the most energetic phenomena occurring in nature. These phenomena typically involve dynamical nonthermal processes and include interactions of high-energy particles (electrons, positrons, protons, pions, etc.) with matter, photons, and magnetic fields; high-energy nuclear interactions; matter-antimatter annihilation; and possibly other fundamental elementary particle interactions. High-energy gamma-rays are emitted over a wide range of angular scales from a diverse population of astrophysical sources. Stellar mass objects, in particular neutron stars and black holes, the nuclei of active galaxies that likely contain super massive black holes, interstellar gas in the galaxy that interacts with high-energy cosmic rays, the diffuse extragalactic background, supernovae that may be sites of cosmic-ray acceleration, and gamma-ray bursts are all gamma-ray emitters. Even the Sun has been found to produce high-energy gamma-rays during active periods. Many of the sources of high energy gamma-rays exhibit transient phenomena, ranging from the subsecond timescales of the fastest gamma-ray bursts to AGN flares lasting days or more. Often these sources radiate the bulk of their power at gamma-ray energies.

The GLAST mission is a high-energy gamma-ray observatory designed for making observations of celestial gamma-ray sources in the energy band extending from 20 MeV to 300 GeV. The science objectives of GLAST are presented in the *GLAST Science Requirements Document*. Some of the major areas of science to be addressed by GLAST include, but are not limited to, the following topics:

- Active Galactic Nuclei (AGN): Gamma-ray observations have yielded a great many results on individual sources, allowed the beginnings of class studies that have become an integral part of the multiwavelength approach to studying blazars. Despite this, fundamental questions about the formation of AGN jets, particle acceleration, and broad band radiation mechanisms remain. By studying gamma-ray emission from all known blazars (and possibly other AGN classes) and correlating these observations with those at other wavelengths, new understanding of the AGN phenomenon is expected to result.

- Isotropic Background Radiation: The identification of a true isotropic cosmic background would have profound implications on studies of the early Universe. Spatial and temporal studies of the isotropic emission and the search for anisotropies will connect nicely with AGN-class studies to fully describe the diffuse radiation.

- Gamma Ray Bursts: By detecting high-energy radiation from approximately 100 bursts per year (as compared to ~1 per year for EGRET), GLAST will provide constraints on physical mechanisms for gamma-ray bursts and allow studies of the relationship between GeV emission and keV-MeV emission as a function of time. Measurements of intrinsic burst spectra at GeV energies can be used to constrain relativistic fireball models and provide measurements of cutoffs due to absorption on the extragalactic background light.

- Molecular Clouds, Supernova Remnants, and Normal Galaxies: Determining the sites and mechanisms of cosmic-ray production is a fundamental problem in astrophysics. GLAST gamma-ray mapping and energy spectral measurements will provide direct evidence of proton cosmic-ray acceleration in supernova remnants.

- Endpoints of Stellar Evolution - Neutron Stars and Black Holes: An order of magnitude increase in the number of detected gamma-ray pulsars will greatly enhance our understanding of the basic structure of pulsar magnetospheres and the sites and nature of particle acceleration. The ability to detect radio-quiet pulsars out to the galactic center will provide important new insights into the basic statistics of pulsar birthrates as well as a much better understanding of the pulsar contribution to the diffuse Galactic emission.

- Unidentified Gamma Ray Sources: Determining the type of object(s) and the mechanisms for gamma-ray emission from the unidentified gamma-ray sources is important. By measuring precise positions of these sources, the possible relationship between unidentified sources and supernova remnants, radio pulsars, molecular clouds, and other candidates can be explored. Perhaps one or more entirely new source population(s) is involved.

- Dark Matter: Many models of cold dark matter feature heavy supersymmetric particles whose line emission can be detected in the 10's or 100's of GeV range. Another form of dark matter may be primordial black holes. While EGRET has already set important limits on primordial black hole production, greater sensitivity, and the ability to identify and distinguish between photons arriving simultaneously in the instrument would aid in further primordial black hole studies.

2.2 Categories of Participation

This AO is a solicitation for proposals in the following categories:

2.2.1 Large Area Telescope Investigation

This AO invites proposals for scientific investigations for which a Large Area Telescope, capable of fulfilling the science objectives listed in the *GLAST Science Requirements Document*, is proposed to be developed. NASA intends to select a single Large Area Telescope for GLAST. The principal investigator of such a proposal, if selected, will be a GLAST Instrument Principal Investigator (IPI). The IPI and three Co-Investigators, designated in the proposal, of the selected Large Area Telescope proposal will be members of the GLAST Science Working Group (SWG).

2.2.2 Gamma-ray Burst Monitor and/or Other Secondary Instrument Investigation(s)

This AO solicits proposals for scientific investigations for which a Gamma-ray Burst Monitor is proposed to be developed, possibly along with other secondary instrument(s). The Principal Investigator of such a proposal, if selected, will be a GLAST IPI. NASA may, or may not, select a Gamma-ray Burst Monitor and/or other secondary instrument for GLAST. The IPI of any selected secondary instrument will be a member of the GLAST SWG.

2.2.3 Interdisciplinary Scientist(s)

This AO solicits proposals for scientific investigations that utilize the GLAST instruments or otherwise support the GLAST science objectives, but do not involve the development of flight instrumentation. The Principal Investigator of such a proposal, if selected, will be a GLAST Interdisciplinary Scientist (IDS). IDS's will, in addition to performing their scientific investigations, be members of the GLAST Science Working Group (SWG) (see Section 5.4 of Appendix D). The SWG will assist the GLAST Project by maintaining a broad and critical scientific overview of the GLAST development. The SWG will advise the GLAST Project of new developments in related scientific fields that could have a potential impact on the objectives of GLAST. Proposers for IDS should possess a broad knowledge of gamma-ray astronomy and experience in other science areas, such as high-energy physics or other fields of astrophysics, that can enhance the scientific productivity of GLAST. IDS proposals may not propose development of flight instrumentation, nor may they include Co-Investigators. A proposer will not be selected for both IPI and IDS positions. A proposer for IDS may, however, appear as a Co-Investigator on an IPI proposal. NASA intends to select approximately four IDS's.

3.0 BACKGROUND

3.1 Previous High Energy Gamma Ray Missions

The first definitive high-energy gamma-ray astronomy observations from space were obtained with an instrument on NASA's OSO III in 1967. The detector had an effective area of approximately 4 cm^2 and confirmed predictions and less definitive observations from balloon-borne instruments that the Milky Way was a source of diffuse gamma-ray emission. The high energy gamma-ray detector on SAS-2, launched by NASA in 1972, had an effective area of about 100 cm^2 and very low instrumental background. Although the SAS-2 detector operated for only seven months, it was the first to detect the isotropic, apparently extragalactic, background gamma-ray emission. It also detected the Crab and Vela pulsars and discovered the then-unidentified Geminga pulsar and provided more detail on the galactic diffuse emission. The high-energy gamma-ray detector on COS-B, which was launched by ESA in 1975, had an effective area of about 50 cm^2 and higher background than SAS-2, owing to the instrument design and an elliptical orbit that carried it deep into the radiation belts and the harsh cosmic-ray environment for much of its orbit. COS-B operated for seven years and yielded a catalog of 25 gamma-ray point sources including 3C 273, the first known extragalactic high energy gamma-ray source.

The EGRET instrument on NASA's Compton Gamma Ray Observatory, launched in 1991 and still operating, has an effective area of approximately 1500 cm^2, good angular resolution, and a very low instrumental background. The most recent catalog of EGRET point sources has more than 250 entries, including five gamma-ray pulsars. EGRET observations have established blazars as an important class of extragalactic gamma-ray emitters. The EGRET detection of the Large Magellanic Cloud established that cosmic rays are most likely Galactic in origin. EGRET has permitted detailed study of the diffuse emission from the Milky Way and resolved several interstellar cloud complexes. The majority of the EGRET sources remain unidentified, many of which are seen to be variable, occasionally flaring on time scales of less than one day. EGRET has also detected high-energy gamma-ray emission from several gamma-ray bursts and from solar flares.

3.2 Programmatic Recommendations to NASA

The NASA Gamma Ray Astronomy Program Working Group (GRAPWG) considered the science priorities of NASA's gamma-ray astronomy program following the ongoing Compton Gamma Ray Observatory and Rossi X-ray Timing Explorer missions and the upcoming ESA INTEGRAL mission. In their April 1997 report entitled *Recommended Priorities for NASA's Gamma Ray Astronomy Program 1996-2010*, the highest priority recommendation of the GRAPWG is a next generation high-energy gamma-ray mission with the scientific capabilities of GLAST.

In an April 1997 report entitled *The Evolving Universe: Structure and Evolution of the Universe Roadmap 2000-2020*, the NASA Structure and Evolution of the Universe Subcommittee (SEUS) laid out a science roadmap for NASA's Structure and Evolution of the Universe science theme

within the Office of Space Science. The first observatory-class NASA mission recommended to meet the SEUS's highest priority science objectives is a high-energy gamma-ray facility that will observe, among many other things, relativistic jets and study the sources of cosmic gamma-ray bursts. The SEUS recommended GLAST as the next step in exploring the high-energy gamma-ray sky.

The NASA Office of Space Science's most recent strategic plan (November 1997), *The Space Science Enterprise Strategic Plan: Origin, Evolution, and Destiny of the Cosmos and Life*, presents the goals and objectives for NASA's space science program, as well as the missions and programs to address those goals. In that plan, the Space Science Advisory Committee (SScAC) recommended GLAST as a key component of a mission suite aimed at providing critical progress toward the OSS science program goals.

4.0 REQUIREMENTS AND CONSTRAINTS

4.1 General Program Constraints and Guidelines

A proposal must establish the scientific merit of the investigation proposed. As a proposal that is responsive to the stated objectives of this AO may require the definition, design, development, and application of space flight and ground support equipment and instrumentation, it must adequately address the feasibility of the technical approach, the compatibility with the spacecraft interfaces, and the reasonableness of the efforts required within the proposed budget and schedule.

The GLAST scientific instruments will be designed and developed within the framework of a tightly cost-constrained program. The phases of science instrument definition, design, development, delivery, and acceptance testing must be completed according to the schedule in Section 4.7. It is imperative that a proposer establish and maintain a credible low cost approach and schedule throughout the development of flight-quality instruments and support hardware and software.

Instrument Principal Investigator proposals must designate a single Instrument Principal Investigator (IPI) who may be from any category of domestic or nondomestic organizations, including educational institutions, industry, nonprofit institutions, NASA Centers, and other Government agencies. The IPI will be held fully responsible for the conduct of the proposed efforts, including: the quality of the scientific investigation and the dissemination of results; all necessary developments; timely delivery of required documentation, software, and equipment within budget limitations; and final performance of the instrument. The IPI will be the principal point of contact with the NASA Program and Project offices. The IPI must be supported by an appropriate team of personnel that may also include Co-Investigators. Each Co-Investigator identified in the proposal must have clearly defined responsibilities involving definition and conduct of the scientific investigations and/or development of the science instrument.

Teaming arrangements among universities, industry, nonprofit institutions, and/or Government agencies (both foreign and domestic) are encouraged for IPI proposals.

To ensure that the GLAST payload complement is compatible with all cost, schedule, and technical requirements, the investigations selected under this proposal will be implemented in two phases. The first phase will be for formulation only (Phase A/B). The second phase will be for implementation, flight operations, and data analysis (Phase C/D and Phase E). Progress from formulation to implementation is predicated on the successful completion of a NASA Nonadvocate Review (NAR). Based on the results of the NAR, the NASA Associate Administrator for Space Science will confirm the investigation as originally selected, direct modification to meet project schedule and funding limitations, or terminate the selected investigation. If confirmed for implementation, firm commitments to performance specification, cost, schedule, and scope will be established. Proposals submitted in response to this AO must cover the entire program, including the formulation, implementation, and operations phases.

Instrument Principal Investigator proposals submitted in response to this AO must address the science objectives for the mission, as defined in the *GLAST Science Requirements Document* and show how the proposed scientific investigation will help meet those objectives. Proposals must exhibit a technically feasible approach using current technology or technology that can reasonably be expected to be developed within the proposed schedule and resources. IPI proposals must include the development of software, as required, to support instrument operations and data analysis, generation of command lists, health and safety monitoring, and data processing and calibration to a level that is usable by the general community.

The GLAST program will fund the development and operation of three Centers and a Guest Observer Facility (GOF). The centers include an instrument operations center (IOC), a science operations center (SOC), and a mission operations center (MOC). Of these four facilities, only the development and operation of the IOC is solicited by this AO; IPI proposals must include provision of an IOC. The cost of the development and operations of this facility must be clearly delineated in the cost proposal and must be accommodated within the budget described in this AO.

In general, the IOC will support the operation of the instrument, perform low level data analysis and provide those data to the SOC, and perform higher level data analysis to support the science investigations performed by the IPI team. The SOC will perform higher level science data processing and archiving, and manage the instrument observing sequence. The MOC will operate the spacecraft, send and receive command and telemetry loads to the spacecraft and instrument, and perform health and safety monitoring. The GOF, which may be a part of the SOC, will support the data processing and investigations conducted by Guest Observers selected under a future NASA solicitation. The following paragraphs give a more detailed description of what the IOC must provide, and, for background information, a further description of the SOC activities.

The IOC will be responsible for carrying out the following tasks both prior to and during flight: nominal instrument operations, instrument calibration, instrument monitoring, production and maintenance of operations software, support of the Mission Operation Center and Guest Observer Facility, and production of data analysis software. Following launch, the IOC will be responsible for the production of low-level standard data products useable by the general community, verification of flight data, and processing of data to support the IPI team's investigations.

The tasks anticipated to be performed by the Science Operations Center are not solicited in this AO and should not be included in the proposal for an instrument operations center. Among the tasks planned for the Science Operations Center will be the support of peer reviews for the GLAST Guest Observer program, creation of the observing time line, modification of operations for targets of opportunity during flight, production data (high-level) processing of the entire data set, generation of high-level data analysis tools, and creation and maintenance of the GLAST public data archive.

The GLAST spacecraft will be solicited by the GLAST Project Office (see Appendix D). The spacecraft provider will be responsible for the development of the spacecraft bus, the system-level integration and test with the selected instrument(s), and the integration and test with the launch vehicle. A spacecraft accommodations study will be performed in FY 2000 by potential spacecraft vendors, following the selection of investigations under this AO. The accommodations study will determine the feasibility of using a catalogued spacecraft vendor from the GSFC Rapid Spacecraft Development Office (RSDO). If feasibility is determined, then a Request For Offer will be released in the third quarter of FY 2001 with a spacecraft contract awarded by the end of FY 2001. If a catalogued vendor from the RSDO does not satisfy the GLAST mission needs, then a procurement for a unique spacecraft design will be initiated with a Request for Proposal in the fourth quarter of FY 2000.

Interdisciplinary Scientist proposals submitted in response to this AO must address the science objectives for GLAST and show how the proposed scientific investigations will help meet those objectives using instrumentation having the performance characteristics specified in Section 4.2 of this AO.

All proposed science investigations should specify a discrete number of objects or sources for investigation that are consistent with the nominal mission profile requirements in Section 4.2. Proposals to reserve entire classes of objects or an entire field of research for exclusive investigation by an IPI or IDS proposal are not permitted. However, all scientific investigators will be allowed access to the data obtained within the nominal mission profile. All instrument data must be available to the general public following an appropriate period for data calibration and verification. The periods will be negotiated following selection.

Investigators may submit more than one proposal. However, a proposer will not be selected for both IPI and IDS positions.

4.2 Science Requirements

4.2.1 Large Area Telescope

The *GLAST Science Requirements Document* presents the science requirements for the GLAST Large Area Telescope. These requirements have been used to generate expected performance characteristics for the Large Area Telescope and are summarized in Table 1. Proposers are encouraged to propose tradeoffs between these characteristics in order to optimize scientific return and to trade the scientific return against instrument cost, mass, size, and power.

TABLE 1: Expected Performance of the Large Area Telescope

Parameter	Baseline	Goal
Energy Range	20 MeV – 300 GeV	10 MeV – >300 GeV
Energy Resolution [1]	10% (100 MeV – 10 GeV) 50% (20 – 100 MeV)	2% @ E > 10 GeV
Effective Area [2]	8000 cm^2	>10,000 cm^2
Single Photon Angular Resolution (68%; on-axis) [3]	< 3.5° @ 100 MeV < 0.15° @ E > 10 GeV	<2° @ 100 MeV <0.1° @ E>10 GeV
Single Photon Angular Resolution (95%; on-axis) [3]	$< 3 \times \theta_{68\%}$	$2 \times \theta_{68\%}$
Single Photon Angular Resolution (off-axis at FWHM of FOV)	< 1.7 times on-axis	< 1.5 times on-axis
Field of View [4]	2 sr	>3 sr
Point Source Sensitivity [5] @ E > 100 MeV	4×10^{-9} cm^{-2} s^{-1}	$<2 \times 10^{-9}$ cm^{-2} s^{-1}
Time Accuracy[6]	10 μsec absolute	2 μsec absolute
Background Rejection	$> 10^5$:1	$> 10^6$:1
Dead Time	< 100 μs per event	< 20 μs per event and < 10% instrument average for event rates up to 10 kHz
Mission Life	5 years, with no more than 20% degradation of above parameters	10 years

[1] Equivalent Gaussian sigma, on-axis.
[2] Peak effective area, including inefficiencies necessary to achieve required background rejection.
[3] Space angle for 68% and 95% containment.
[4] Integral of effective area over solid angle divided by peak effective area.
[5] Sensitivity at high latitudes after a 2 year survey for a 5 sigma detection.
[6] Relative to Universal Time.

4.2.2 Gamma-ray Burst Monitor and/or Other Secondary Instrument

The *GLAST Science Requirements Document* presents the science requirements for a possible GLAST Gamma-ray Burst Monitor. These requirements have been used to generate the expected performance characteristics summarized in Table 2. Proposers are encouraged to propose tradeoffs between these characteristics in order to optimize scientific return and to trade the scientific return against instrument cost, mass, size, and power, for a Gamma-ray Burst Monitor and/or any other proposed secondary instrument.

TABLE 2: Expected Performance of the Gamma-ray Burst Monitor

Quantity	Baseline
Energy Range	Low energy gamma-ray, X-ray
Field of View	> ~ 3 sr
Sensitivity	0.5 photons cm^{-2} s^{-1}

Nominal total resources for any proposed secondary instrument(s) for mass, power, and average data rate, are 50 kg, 50 W, and 10 kbps, respectively.

4.2.3 Nominal Mission Profile

The GLAST Facility Science Team has recommended a nominal mission profile for GLAST. Instrument Principal Investigator proposals and Interdisciplinary Scientist proposals should be consistent with this mission profile, as follows.

After a 30-60 day in-orbit checkout, GLAST will conduct twelve months of scanning observations. The scanning pattern will be selected to cover the entire sky in a manner that is scientifically optimized. The scanning observations of the first year may be interrupted only to respond to extraordinary Targets of Opportunity. Subsequent years of operation will consist of a combination of scanning and pointing observations as driven by competitive Guest Observer proposals.

During the first year of operations following the in-orbit checkout period, the Large Area Telescope instrument team will be responsible for calibration of the instrument and verification of the data. The LAT instrument team will be responsible for the conduct of an all-sky survey during the first year of operations. It is anticipated that the team will develop a catalog of high-energy gamma-ray sources and carry out other science investigations as detailed in their IPI proposal. All data from the first year of operations will be placed in the GLAST public data archive within 12 months of receipt of data, in useable form. A shorter period may be negotiated following selection. This period of time will allow for instrument calibration and data verification. During the first year, IDS investigators will work with the LAT team, will have access to the data, and will assist in the data verification activities.

During the first twelve months of science operations, data from specific sources of interest to qualified individual researchers will be made available upon request to the Guest Observer Facility. Note that large projects, i.e., those involving large number of sources and/or very long observing times, will not be permitted by outside researchers during this period. At all times, including the first twelve months of science operations, the data from transient sources discovered or detected by GLAST will immediately be made publicly available. During the first twelve months of operations, the instrument may not have been completely calibrated, and, thus, any data made available may be unvalidated and unverified.

Interdisciplinary Scientists should propose science investigations that can be carried out using data from the all-sky survey and/or data from the GLAST public data archive. No specific instrument pointings or other science operations of the GLAST satellite are expected to be carried out to support IDS investigations.

After the first twelve months, the GLAST observing program will be based upon a Guest Observer program for which NASA intends to release periodic calls for proposals. Proposals will be competitively peer reviewed, and the selected set of investigations will comprise the GLAST viewing plan. Data that are gathered for a selected investigation will be verified by the Guest Observer. After a three month data verification period, the data will be delivered to the SOC for inclusion in the GLAST public data archive. Data that are not gathered in response to a selected science investigation will be verified by the GLAST Guest Observer Facility. The data will be placed in the GLAST public data archive after a two week data verification period.

Key Projects may be carried out within the GLAST Guest Observer program. These are defined as large science investigations that involve new pointed or scanning observations or large scale utilization of the GLAST public data archive. Key Projects will be solicited from the scientific community (including instrument team members and IDS's) and selected through the Guest Observer program competitive peer review. Key Projects may be proposed based upon observations and/or archival data obtained during any part of the mission, including the first twelve months. However, Key Projects using archival data from the first twelve months must be compatible with the LAT team's all-sky survey and other science investigations selected under this AO. Observational data for Key Projects will be verified by the investigation team; after a three month data verification period, they will be delivered to the SOC for inclusion in the GLAST public data archive.

4.3 Education, Public Outreach, Technology, and Small Disadvantaged Business Requirements for Instrument Principal Investigator Proposals

IPI Proposals will be evaluated for their education, public outreach, new technology, and small disadvantaged business activities.

4.3.1 Education and Outreach

The Office of Space Science (OSS) has developed a comprehensive approach for making education at all levels (with a particular emphasis on K-14 education), and the enhancement of public understanding of space science, integral parts of all of its missions and research programs. There are two key documents that provide guidance and establish the basic policies for OSS Education and Public Outreach activities. These are a strategic plan, entitled *Partners in Education: A Strategy for Integrating Education and Public Outreach Into NASA's Space Science Programs* (March 1995), and an accompanying implementation plan, entitled *Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy* (October 1996). Both of these documents may be obtained electronically by selecting "Education and Public Outreach" from the menu on the OSS homepage at <http://spacescience.nasa.gov/>, or as hardcopy from Dr. Jeffrey Rosendhal, Office of Space Science, Code S, NASA Headquarters, Washington, DC 20546-0001.

In accord with these established OSS policies, Education and Public Outreach (E/PO) will be an integral element of the GLAST Program, and 1-2% of the total program budget will be allocated to education and outreach. All selected, NASA-funded, scientific participants will be expected to become actively involved in planning and implementing an E/PO program.

Proposers to this AO that are supplying flight hardware (IPI proposals) are required to include an E/PO component as a part of their overall proposal. OSS expects that a substantive education/outreach program will be an integral element of the investigation and that proposers will devote adequate resources to the planning and implementation of such an effort. The general funding guidelines for E/PO for the mission as a whole also apply to the E/PO component of instrument investigations (i.e., 1-2% of the total budget). Proposals must include the Principal Investigator's approach for planning an education/outreach program, establishing for appropriate partners and alliances, implementing the education/outreach program (including appropriate evaluation activities), and disseminating education/outreach products and materials. See Appendix E for further information on expected proposal content.

IDS proposers will be expected to participate in the common GLAST Education/Public Outreach program, but will not be expected to submit a separate E/PO element. OSS expects that individual IDS's must be prepared to spend an average of approximately 5% of their time, as part of their normal ongoing work, supporting Education/Public Outreach activities. Such activities may include, but are not limited to: developing ideas for creative and worthwhile educational materials; preparing written background information suitable for primary and secondary school educational resources; and preparing portions of their data for use in educational and public outreach materials. IDS proposers must include an explicit statement in the proposal of their willingness to participate in E/PO on this basis and must budget appropriately for such work as part of their proposal.

It should be noted that, in addition to their individual E/PO programs, selected, NASA-funded instrument investigator teams (together with IDS investigators) will be expected to become actively involved in creating, designing, planning, and implementing a common GLAST Education/Public Outreach program to be carried out by the LAT IPI Team. It is anticipated that the LAT IPI will take steps after selection to establish an overall program that integrates any other IPI E/PO programs and the IDS efforts. These may include planning workshops that will focus on ways to fulfill NASA's education and outreach objectives, encourage the flow of creative ideas, inspire innovative approaches, and define and implement an integrated E/PO program.

See Appendix E for a detailed discussion of the evaluation criteria for E/PO proposals. Appendix E also provides information on the assistance available to develop E/PO proposals.

4.3.2 Advanced Technology

NASA seeks to infuse new technologies that enhance performance and reduce costs into its programs and to strengthen the mechanisms by which it transfers such technologies to the private sector, including the non-aerospace sector. The means by which NASA's Office of Space Science plans to implement new technology is described in the *Office of Space Science Integrated Technology Strategy* (April 1994), which can be accessed through the World Wide Web by selecting "Policies and Publications" from the menu on the OSS homepage at <http://spacescience.nasa.gov/>. GLAST presents an opportunity to develop and test new technologies and applications. Investigations dependent on new technology will not be penalized for risk provided that a credible plan, including cost and schedule for implementing the new technology is shown, and adequate plans are described to provide a reasonable back-up approach that will assure the success of the investigation.

4.3.3 Small Disadvantaged Businesses and Minority Institutions

The Instrument Principal Investigator(s) shall agree to use their best efforts to assist NASA in achieving its goal for the participation of small disadvantaged businesses, women-owned small businesses, Historically Black Colleges and Universities, and other Minority Educational Institutions in NASA procurements. Involvement of these organizations reflects NASA's commitment to increase the participation of minority concerns in the aerospace community and is viewed as an investment in our future. Offerors, other than small business concerns and solitary investigators, are also advised that contracts resulting from this AO will be required to contain a subcontracting plan that includes goals for subcontracting with small, small disadvantaged, and women-owned small business concerns (see Appendix A, Section XIII).

4.4 Technical Approach Requirements for Instrument Principal Investigator Proposals

Proposals must encompass all technical aspects of the investigation from the initial studies through data analysis and delivery of the data to the appropriate data repository. NASA Program Guidelines NPG 7120.5A (see Appendix C for information on accessing this document) delineates activities, milestones, and products typically associated with each of these phases and may be used as a reference in defining a team's integrated approach. While IPI teams have the freedom to use their own processes, procedures, and methods, the technical evaluation of the offerer's proposal will place significant importance on the offerer's ability to demonstrate strong management and sound practice in the key systems management disciplines of systems engineering, requirements management, configuration management, cost estimation/analysis, risk management, and project management. The use of innovative processes is encouraged when advantages in cost, schedule, technical improvements, and reliability can be demonstrated.

Each investigation shall have a cost-effective investigation assurance and safety program. This program should include a quality assurance program that is consistent with the ISO 9000 series, American National Standard, *Quality Systems -- Model for Quality Assurance in Design, Development, Production, Installation. And Servicing, ANSI/ASQC Q9001-1994*.

The GLAST spacecraft procurement will follow the instrument definition effort. The GLAST Project Office at the NASA Goddard Space Flight Center (GSFC) will manage the mission systems engineering effort to ensure that the instrument designs resulting from this AO will be compatible with currently available spacecraft. In order to ensure that the GLAST instruments remain compatible with the GLAST spacecraft, all instruments must meet the generic interface requirements in the *GLAST Instrument to Spacecraft Interface Requirements Document* (see Appendix C). IPI proposals may propose deviations from this interface only if they specify sufficient funds in the IPI proposal within the funding guidelines of Section 4.6 to fund the development of a nonstandard spacecraft interface.

IPI proposals must also include a detailed description of the preflight and in-orbit calibration plan to verify the soundness of the instrument before launch and in-orbit operations. The LAT proposer must also demonstrate by a balloon flight of a representative model of the flight instrument or by some other effective means the ability of the proposed instrument to reject adequately the harsh background of a realistic space environment. If another option besides a balloon flight is proposed, it must be adequately justified. A software simulation is not deemed adequate for this purpose.

A description of how the proposer will work with and interface with the GSFC Project Team and the spacecraft provider must be included.

4.5 Management Requirements for Instrument Principal Investigator Proposals

Investigation teams must be led by a single Principal Investigator (PI) who may be from any category of U.S. or non-U.S. organization, including educational institutions; industry or nonprofit institutions; or from one of the NASA Centers, other Federally-funded research and development centers, or other U.S. Government agencies. Teams may be formed from personnel from any combination of these institutions.

NASA intends to allow the PI and his/her team to use their own management processes, procedures, and methods to the fullest extent possible. Investigation teams must define the management approach best suited for their particular teaming arrangement. This approach must be commensurate with the investigation's implementation approach, while retaining a simple and effective management structure that assures adequate control of development within the cost and schedule constraints. The investigation team must develop a Work Breakdown Structure that best fits its organizational approach and investigation design concept.

The PI is expected to be the central person in charge of the investigation with full responsibility for its scientific and technical integrity. The PI is responsible for assembling a team to propose and implement the investigation. Proposers may obtain services from any source but the required level of management detail in the proposal is the same regardless of what organizations are part of the investigation team, including NASA Centers, other Government laboratories, or Federally Funded Research Centers. The PI is accountable to NASA for the scientific success of the investigation. Therefore, the PI must be prepared to recommend termination of the investigation if, in his/her judgment, the successful achievement of established science objectives, as defined in the proposal, is no longer likely within the committed cost and schedule reserves.

The PI must define the risk management approach he/she intends to use to ensure successful achievement of the objectives of the investigation within established resource and schedule constraints. Included in this discussion of risk management must be descope options and risk mitigation plans for any new technologies and the need for any long lead items that need to be placed on a contract before the start of the development phase, to ensure timely delivery. Risks associated with complexities in management structure, if several different organizations are involved, should be addressed. In addition, manufacturing, test, or other facilities needed to ensure successful completion of the proposed investigation must be identified.

Each selected investigation must have an Instrument Project Manager (PM) who will oversee the technical implementation of the investigation. The role, qualifications, and experience of the PM must be adequate to ensure that the technical and managerial needs of the investigation will be met.

4.6 Cost Requirements

4.6.1 NASA Costs

The NASA funds available for instrument investigations proposing a Large Area Telescope, as well as instrument investigations proposing a Gamma-ray Burst Monitor and/or any other secondary instrument, are given below in real year dollars (RY$). NASA expects to select a single Large Area Telescope. Funds used for a Gamma-ray Burst Monitor, and/or any other secondary instrument, will reduce the funds available for the Large Area Telescope. Therefore, proposers of a secondary instrument, including a Gamma-ray Burst Monitor, will have a cost cap of $5 million for their total cost to NASA. LAT proposers should identify in their descope options the funds that would be available to acommodate such an investigation and allow the total instrument cost to remain within the cost cap. NASA reserves the right not to select a Gamma-ray Burst Monitor or any other secondary instrument. Note that prior to the PDR, IPI's are required to provide a demonstration of the capability of the proposed instrumentation to handle the multi-component background expected to be encountered in the space environment. This may be accomplished via a balloon flight (or other suitable test) of a prototype instrument and must be budgeted within the awarded funds.

The distribution of funds for instruments is given below:

	Fiscal Year	2000	2001	2002	2003	2004	2005
Instruments	RY$ (M)	3.6	3.9	15.5	20.3	20.8	7.7

The NASA funds available during flight (Phase E) for the IPI teams to satisfy the requirements for an Instrument Operations Center (IOC) and to conduct science investigations are given below in RY$. (For information purposes, note that other funds will be allocated by NASA for the Science Operations Center and the Guest Observer program, expected to be on the order of approximately $7M per year in RY$. An additional $2M per year in RY$ have been budgeted for mission operations from 2006 through 2010.)

	Fiscal Year	2006	2007	2008	2009	2010
IOC and science	RY$ (M)	2.9	2.5	2.1	1.8	1.6

The NASA funds available for Interdisciplinary Scientist (IDS) investigations are given below in RY$. These are the average funds available for a single IDS under the assumption that four IDS's are selected. NASA reserves the right to select more than four IDS's, but with proportionately smaller average funding levels.

	Fiscal Year	2000	2001	2002-2010
IDS (each)	RY$ (K)	20	35	100 / yr

All dollar amounts are in Real Year (RY) dollars.

4.6.2 Full Cost Accounting

The available funding given in section 4.6.1 does not include full cost accounting for any NASA Civil Service labor. Therefore, if NASA provided services are proposed, the proposed cost plan must include Civil Service labor at the nominal rates taxed by their institution for that institution's program support. This is the cost plan that will be evaluated against the funds available, as shown in Section 4.6.1. In addition, any proposing NASA institution must also include a separate cost proposal that includes all the proposed Civil Service labor and supporting NASA Center infrastructure costs on a full cost accounting basis. These costs will not be evaluated against the funds available, but are for information purposes only, to allow NASA to estimate the full cost requirements proposed for this mission. If any NASA costs are to be considered as contributed costs, the contributed item(s) must be separately funded by an effort complementary to the proposed investigation, and the funding sources must be identified.

4.6.3 Goods and/or Services Offered on a No Exchange of Funds Basis

Contributions of any kind, whether cash or noncash (property and services), to GLAST investigations by organizations other than the Office of Space Science are welcome. Such contributions may be applied to any part or parts of an investigation. A letter of endorsement that contains a statement of financial commitment from each responsible organization offering to make a contribution to the investigation must be submitted with the proposals for all U.S. components. For non-U.S. components of proposals, see Section 4.8.

4.7 GLAST Schedule Requirements

GLAST is planned for a September 2005 launch. Proposed instrumentation must be fully integrated, environmentally tested, and ready for delivery to the GLAST spacecraft no later than December 1, 2004. A tentative schedule for the GLAST mission is provided below. Investigations proposing flight instrumentation must support this schedule. However, the proposed instrument schedule may show different phases and major review dates (i.e., PDR, CDR) if required to support the instrument meeting the delivery date. Note that the instrument schedule must still support the Project milestones listed below. For example, an IPI proposal can show a CDR earlier than the Mission CDR shown below, if required to support milestones in the instrument development, as long as the proposal shows plans to support the Mission CDR. The System Requirements Review, Independent Assessment, Nonadvocate Review, instrument delivery and launch dates must be supported on the dates shown below. All dates beyond the proposal due date for this AO are estimates and are subject to change.

Concept Study (Phase A).....February 1, 1999 – March 31, 2000
System Requirements Review (SRR).....June 1, 2000
Formulation (Phase B)..... April 1, 2000 – September 30, 2001
Independent Assessment..... April 1, 2000 – August 31, 2000
Preliminary Design Review (PDR).....April 1, 2002
Nonadvocate Review (NAR).....August 17, 2001
Implementation (Phase C/D)..... October 1, 2001 – September 30, 2005
Critical Design Review (CDR) .....April 1, 2003
Instrument Delivery..... December 1, 2004
Launch..... September 1, 2005
Flight Operations (Phase E) ..... October 1, 2005 – September 30, 2010

4.8 International Participation

Recognizing the potential scientific, technical, and financial benefits offered to all partners by international participation, participation by non-U.S. individuals and organizations as Principal Investigators, Co-Investigators, or team members in GLAST investigations is encouraged. Participation may include, but is not limited to, the contribution of instrument hardware, necessary facilities and services, and the subsequent sharing of the data from the mission, all on a no-exchange-of-funds basis.

The direct purchase of goods and/or services from non-U.S. sources is permitted. However, proposers are advised that a contract or subcontract using funds derived from NASA by a U.S. team with a non-U.S. participant must meet NASA and Federal regulations. These regulations place an additional burden on investigation teams that must be explicitly included in discussions of the investigation's cost, schedule, and risk management. Information regarding regulations governing the procurement of non-U.S. goods or services is provided in Appendix F.

Participation by non-U.S. individuals and/or institutions as team members or contributors to GLAST investigations must be endorsed by the institutions and/or governments involved. If government support is required, then a government endorsement is also needed. The letter of endorsement must provide evidence that the non-U.S. institution and/or government officials are aware and supportive of the proposed investigation and will pursue funding for the investigation if selected by NASA. The endorsement must be submitted per the schedule in Section 1.4.

If NASA selects a mission with a U.S. PI but with non-U.S. participation, signed agreements with all non-U.S. partners must be submitted after selection. Sponsoring organizations of non-U.S. participation should commit directly to the PI, not NASA. NASA recognizes that unique circumstances or arrangements may dictate an agreement between the non-U.S. sponsoring organization and NASA. If so, the resulting international agreements must be made in full compliance with U.S. Government law or policies regarding export control.

Should a proposal with a non-U.S. PI be selected, NASA's Space Science and Aeronautics Division within the Office of External Relations, will arrange with the non-U.S. sponsoring agency for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency will each bear the cost of discharging their respective responsibilities. Depending on the nature and extent of the proposed cooperation, these arrangements may entail a letter of notification by NASA with a subsequent exchange of letters between NASA and the sponsoring governmental agency or a formal agency-to-agency Memorandum of Understanding (MOU).

5.0 PROPOSAL SUBMISSION PROCEDURES

5.1 Preproposal Activities

5.1.1 Bibliography of Relevant Reports and Applicable Documents

Appendix C provides a bibliography of relevant reports and applicable documents containing references to additional requirements and background information for this Announcement of Opportunity. Especially note that this GLAST bibliography contains references to two documents whose requirements are incorporated into this AO by reference: the *GLAST Science Requirements Document* and the *GLAST Instrument to Spacecraft Interface Requirements Document*.

5.1.2 Technical and Scientific Inquiries

Inquiries of a scientific or technical nature should be directed to Dr. Donald Kniffen, the GLAST Program Scientist, at the address below. Inquiries are preferred in writing and may be sent by fax or E-mail (the character string "GLAST AO" (without quotes) should be included in the subject line of all E-mail transmissions).

Dr. Donald Kniffen
GLAST Program Scientist
Research Program Management Division
Code SR
National Aeronautics and Space Administration
Washington, DC 20546-0001
Phone: 202-358-0351
Fax: 202-358-3097
E-mail: dkniffen@hq.nasa.gov

5.1.3 Notice of Intent to Propose

To assist NASA's planning of the proposal evaluation process, prospective proposers are requested to submit a Notice of Intent to Propose in accordance with the schedule in Section 1.4. Material in a Notice of Intent (NOI) is for NASA planning purposes only, is confidential, and is not binding on the submitter. The NOI is to be submitted electronically by entering the requested information on the site at the World Wide Web address <http://props.oss.hq.nasa.gov/>. Proposers without access to the Web, or who experience difficulty in using this site, should contact Ms. Debra Tripp (E-mail: deb.tripp@hq.nasa.gov) for assistance.

To the extent the following information is known by the NOI due date (see Section 1.4), the NOI should include:

(a) Names, addresses, telephone numbers, E-mail addresses, and fax numbers of (1) the Principal Investigator; (2) Co-Investigators known by the time the NOI is due; and (3) the lead representative from each organization (industrial, academic, educational, nonprofit, and/or Federal) expected to be included in the proposal team;

(b) Title of the proposed investigation, a brief statement of the scientific objectives of the investigation, and a brief description of the proposed instrument, if any (enough detail should be provided to allow the selection of competent reviewers).

In addition to the above, proposers are encouraged to include as appendices a description of any new technology to be employed as part of the investigation and a brief summary of the education/public outreach objectives of the proposed investigation.

5.2 Format and Content of Proposals

General NASA guidance for proposals is given in Appendix A, which is considered binding unless specifically amended in this section of this AO. A uniform proposal format is required from all proposers to aid in proposal evaluation. The required detailed proposal format and contents for this AO are summarized in Appendix B. Failure to follow this outline may result in reduced ratings during the evaluation process or, in extreme cases, could lead to rejection of the proposal without review.

5.3 Submission Information and Certifications

5.3.1 Web-based Cover Page and Certifications

A Cover Page/Proposal Summary must be completed via the web-based form to be found at <http://props.oss.hq.nasa.gov>. This form can be edited, but must be completed and printed in time to procure original signatures of the PI and Authorizing Official of the sponsoring

institution authorized to certify institutional support and sponsorship of the investigation, and of the management and financial parts of the proposal. The cover page must be submitted in hard copy with the proposal by the due date. No changes should be made to the hard copy cover page; all edits must be accomplished via the web form.

Non-U.S. proposals must be signed by an official of the sponsoring agency that certifies support and sponsorship of the proposed investigation. The non-US proposal shall include a letter of endorsement signed by an institutional official from each organization expecting to provide critical, no-exchange-of-funds contributions of hardware, software, facilities, services, etc. This official must certify institutional support and sponsorship of the investigation, as well as concurrence in the management and financial parts of the proposal. Non-U.S. organizations must submit such endorsements to:

Ms. Wavalene Barnes
Ref: GLAST AO 99-OSS-XX
Space Science and Aeronautics Division
Code IS
National Aeronautics and Space Administration
Washington, DC 20546-0001 USA
Phone: 202-358-0900
Fax Number: 202-358-3029

with a copy to:

GLAST AO Support Office
Jorge Scientific Corporation
400 Virginia Avenue, SW, Suite 700
Washington, DC 20024 USA
Fax Number: 202-554-2970

by the due date given in the schedule in Section 1.4.

Note: The authorizing signature of a U.S. institution now also certifies that the proposing institution has read and is in compliance with the three required certifications printed in full in Appendix G at the end of this AO. NASA does not, therefore, require institutions to separately submit these certifications with the proposal.

5.3.2 Proposal Quantity

Proposers must provide 35 copies of their proposal, plus the signed original, on or before the proposal deadline given in Section 1.4.

5.3.3 Submittal Address

All proposals must be received at the following address by the deadline given in Section 1.4:

GLAST AO Support Office
Jorge Scientific Corporation
Suite 700
400 Virginia Avenue, SW
Washington, DC 20024

Point of contact for commercial delivery:
Ms. Debra Tripp (phone: 202-554-2775).

Furthermore, one copy (over and above the 35 copies) of any proposal that includes any non-U.S. participants and/or institutional and governmental commitments must be sent to NASA Code IS at the address listed in Section 5.3.1.

5.3.4 Deadline

All proposals must be received at the address above by 4 p.m. Eastern Time on the closing date specified in Section 1.4. All proposals received after the deadline will be treated in accordance with NASA's provisions for late proposals (Appendix A, Section VII).

5.3.5 Notification of Receipt

NASA will notify the proposers in writing that their proposals have been received. Proposers not receiving this confirmation within two weeks after submittal of their proposals should inquire according to the contact information given in Section 5.1.2.

5.4 Specific Guidelines for Non-U.S. Proposers

Proposals from outside the United States must conform to the uniform proposal format specified in Appendix B. The proposal must be submitted according to the instructions in Section 5.3. In addition, one copy of the proposal and the letters of endorsement must be sent to the address in Section 5.3.1 according to the schedule in Section 1.4.

If review and endorsement are not possible before the announced closing date, sponsoring non-U.S. agencies may, in exceptional situations, forward a proposal without endorsement to NASA's Space Science and Aeronautics Division, Code IS, along with the date when a decision on endorsement can be expected. No proposal will be reviewed by NASA without endorsement from the appropriate government agency.

Proposers from non-U.S. institutions are not required to submit a Cost Proposal unless U.S. individuals seeking NASA support are involved in the proposal. A non-U.S. proposer must, however, submit a Management Proposal. If the proposal seeks NASA support, both Management and Cost Proposals must be signed by the U.S. individual and certified by the U.S. individual's institution in accordance with Section 5.3.1. Similarly, non-U.S. individuals who plan to participate as Co-Investigators on a U.S. proposal must have such participation endorsed by their appropriate government agency.

All proposals from non-U.S. institutions will undergo the same evaluation and selection process as those originating in the United States. For those non-U.S. proposals selected, NASA will arrange with the sponsoring agencies for participation on a cooperative, no exchange of funds basis, in which NASA and the sponsoring agencies will each bear the cost of discharging its separate responsibilities, including travel and subsistence for its own personnel.

6.0 PROPOSAL EVALUATION, SELECTION, AND IMPLEMENTATION

6.1 Evaluation and Selection Processes

All proposals submitted in response to this AO will be subjected to a preliminary screening to determine compliance with the constraints, requirements, and guidelines of this AO. Proposals not in compliance will be returned to the proposer without further review. IPI proposals in compliance with this AO after this preliminary assessment, but before the peer review described below, will be scrutinized for technical, management, and fiscal integrity by NASA. The feasibility of the proposed approach for implementation will be evaluated. The intent of this evaluation will be, first, to assess the likelihood that any proposed hardware can be built and be delivered within the mission schedule for GLAST and, second, to assess the likelihood that the proposed investigation can be completed within the proposed costs and within the cost guidelines stated in section 4.6. The adequacy of the proposed instrument to comply with the constraints of GLAST, including compatibility with the spacecraft interfaces, will be evaluated by NASA during this preliminary review. In addition, the plans for education, outreach, new technology, and small disadvantaged business activities will be evaluated by appropriate experts as part of this preliminary review.

Following these preliminary reviews, the merits of each proposal will be assessed against the criteria in Section 6.2 by a panel of scientific and technical peers of the proposers. The panel may be augmented through the solicitation of mail-in reviews as well, which the panels have the right to accept, in whole or in part, modify, or reject. A non-Government organization may be used by NASA to provide assistance in organizing and documenting the panel review process. The purpose of this peer evaluation is to determine the scientific and technical merit of each proposal expressed in terms of its inherent strengths and weaknesses. Results of the earlier feasibility and cost reviews by NASA will be available to these reviewers.

It is anticipated that the peer review panel will meet for approximately two days, at the end of which questions may be formulated and sent out to each IPI or their designated representative. Such questions will be for the purpose of clarification of points in the proposal, and to obtain any additional information the review team may need to assist them in understanding the intent of the proposal. The following day each IPI will be invited to separately meet with the peer review panel for a limited time to provide an opportunity for the proposer to request clarification of the questions submitted, answer the questions, and present any other information the team deems relevant, subject to the time limitation. The proposing teams will then have approximately one week to respond to the peer review panel's questions in writing. At that point, the peer review panel will meet again to conclude their evaluation of the proposals.

Once the panel evaluations are complete, an *ad hoc* Categorization Subcommittee of the Space Science Steering Committee (see below), composed wholly of Civil Servants, will convene to categorize the proposals, based upon the science peer review and other evaluations, in accordance with procedures required by NFS Part 1872.403-1. These Categories are defined as follows:

> Category I. Well conceived and scientifically and technically sound investigation pertinent to the goals of the program and the AO's objectives and offered by a competent investigator from an institution capable of supplying the necessary support to ensure that any essential flight hardware or other support can be delivered on time and that data can be properly reduced, analyzed, interpreted, and published in a reasonable time. Investigations in Category I are recommended for acceptance and normally will be displaced only by other Category I investigations.
>
> Category II. Well conceived and scientifically or technically sound investigations which are recommended for acceptance, but at a lower priority than Category I.
>
> Category III. Scientifically or technically sound investigations which require further development.
>
> Category IV. Proposed investigations which are recommended for rejection for the particular opportunity under consideration, whatever the reason.

After the categorization of proposals, further discussions between the representatives of the Office of Space Science at NASA Headquarters, the GLAST Project Office at the NASA Goddard Space Flight Center, and the proposers may occur for those proposals rated in the competitive range, i.e., Category I and II. Any such discussions will not be an opportunity to revise a submitted proposal. Note that if this option is exercised, all proposers in the Category I and II range will be contacted, and all those not in these Categories will be so notified and offered a debriefing.

The results of the evaluations and categorizations will be used by the GLAST Program scientist to develop a recommendation for selection. This recommendation will then be forwarded to the Space Science Steering Committee (SSSC), which is composed wholly of NASA Civil Servants and appointed by the Associate Administrator for Space Science. The SSSC will conduct an independent assessment of the evaluation and categorization processes regarding both their compliance to established policies and practices, as well as their completeness, self-consistency, and adequacy of all materials related thereto. The SSSC will also assess the recommendation for selection in light of the requirements and conditions set forth in this AO, and will submit its findings along with the entirety of all evaluation and categorization results to the Associate Administrator who will make the final selections in consultation with the OSS Science Program Director for the Structure and Evolution of the Universe science theme. The overriding consideration for the final selection submitted in response to this AO will be to maximize the scientific return from the GLAST mission within the available budget.

It should also be noted that, in accordance with Section II of Appendix A, NASA reserves the right to select only a portion of a proposer's investigation and/or to invite his/her participation with other investigators in a joint investigation. In that case, all affected proposers will be given the opportunity to accept or decline such partial acceptance and/or participation with other investigators.

Following selection, the successful IPI(s) and IDS's will be appointed members of the GLAST SWG (see Appendix D, section 5.4). Contracts will be established by the GLAST Project Office at GSFC with the selected PIs to support their participation in the SWG. It is expected that funding for the definition studies for investigations proposing the provision of flight instruments will begin quickly thereafter.

Selected proposers will be notified immediately by phone and then by letter and provided with instructions for initiating their formulation (Phase A/B) study. Proposers not selected will be notified by letter and will be offered a debriefing. Such debriefings may be in person at NASA Headquarters or, if the investigation team prefers, by telephone. In the former case, NASA funds may not be used to defray travel costs by the proposer for a debriefing. In either case, along with the proposing Principal Investigator, a lead representative from the key participating institution(s) of a proposal may also attend such debriefings.

6.2 Evaluation Criteria

The fundamental aim of the NASA investigation acquisition process is the identification of scientific ideas that are tested and verified by unique instrumental and/or analytical capabilities that best suit the overall scientific and cost objectives of the GLAST program as described in this AO. Successful implementation of the GLAST program requires that, in addition to scientific and technical merit, the investigations be achievable within established boundary conditions of cost and schedule.

The evaluation criteria below will be used to evaluate and categorize proposals as described in Section 6.1. The evaluation factors, which are described more fully in the subsections below, are:

- The scientific merit of the proposed investigation;
- The technical merit of the proposed instrument (IPI proposals only);
- The feasibility of the proposed approach for implementation, including technical and management risk, cost risk, and schedule risk (IPI proposals only); and
- The competence and experience of the Principal Investigator, investigation team, and sponsoring institution(s).

The first of these criteria is weighted heaviest at about a third of the total. The second and third are equally weighted at somewhat less than the first. The fourth is weighted somewhat less than the others.

In addition to the specific evaluation, NASA and OSS consider that the plan for public education, outreach, new technology, and small disadvantaged business activities is very important and will be considered in the final recommendation to the selecting official.

6.2.1 Scientific Merit of the Proposed Investigation

To evaluate the scientific merit, the goals and objectives of the proposed investigation will be assessed to determine its impact on space science as a whole and, in particular, on the science objectives of the GLAST mission (see Section 2.1 and the *GLAST Science Requirements Document*). This evaluation will include the responsiveness and the relevance of the proposed investigation to the established GLAST mission objectives. A major element in the evaluation will be whether the data that are to be gathered will be sufficient to complete the proposed investigation. An important element of this criterion is the long term value of the data base that any proposed instrument(s) will produce for enabling broad science investigations beyond those specifically proposed, with emphasis on investigations relevant to the stated science objectives of the NASA Office of Space Science and of the GLAST mission.

6.2.2 Technical Merit of the Proposed Instrument

The technical merit of any proposed instrument will be evaluated for investigations requiring the provision of flight instrumentation. Each proposed investigation will be evaluated for its technical merit, feasibility, and the probability of success. Technical merit and feasibility will be evaluated by assessing the degree to which any proposed instrument(s) can be built using the proposed technologies and the degree to which the proposed instrument(s) can provide the necessary data for the proposed investigation, as well as the degree to which the GLAST mission will support the accomplishment of acquisition of the required data. Areas requiring critical technology development of the instrument for flight readiness must be identified. Should a new technology that represents an untested advance in the state of the art be proposed for use, an assessment will be made of the likelihood of the technology for incorporation into the proposed

instrument and its readiness to support the GLAST development schedule. The adequacy of any proposed instrument(s) to comply with the overall physical and functional constraints of the GLAST observatory, and the compatibility of the proposed instrument(s) with the GLAST observatory hardware and with its functional interfaces will be evaluated as well. Other major elements for evaluation include the adequacy of plans for the instrument operations center, the proposed data processing and analysis plan, the timeliness of delivery of the data to the GLAST science operations center, and the quality of the pre-flight calibration plan.

6.2.3 Feasibility of the Proposed Approach for Implementation, Including Cost, Cost Risk, and Schedule Risk

The technical and management approaches will be evaluated to assess the likelihood that the investigation can be implemented as proposed. This includes an assessment of the risk of meeting the project's schedule and of completing the investigation within the proposed cost. The current state of development of the proposed instrumentation hardware and design is a factor in the evaluation of feasibility and risk. The realism of the costs proposed to bring the investigation to a satisfactory completion, compatibility with the cost constraints, a credible schedule that provides the instrumentation, software, and documentation on a schedule compatible with GLAST requirements, the ability of the IPI to meet major project milestones and hardware delivery dates, and adherence to good management practices as exhibited in the management plan, will all be evaluated as part of this criterion. The resiliency of the investigation (the flexibility to recover from problems), including margins, reserves, and descope options, will also be assessed.

The evaluation will consider the proposer's understanding of the processes, products, and activities required to accomplish development of all elements (e.g., flight systems, ground and data systems, etc.) and integration and the adequacy of the proposed approach, as demonstrated in the proposal. The proposed technical approach will be examined in its entirety to ensure that (1) all elements and processes are addressed, (2) weaknesses and design issues are understood and plans for resolution have been identified, (3) fundamental design trades have been identified and studies planned, (4) primary performance parameters have been identified and minimum thresholds established, and (5) the derivation of other performance parameters is addressed. The overall approach (including schedule), plans for working with the Project team and spacecraft team on such things as reviews and systems engineering studies, specific design concepts, and the known hardware/software will be evaluated for soundness, achievability, and maturity. The relevant experience and expertise of the development organizations will be important factors in assessing the probability of success. Innovative cost effective features, processes, or approaches will be rewarded if proven sound.

The information provided in the Management section must demonstrate the proposers' plans, processes, and organization for managing and controlling the development and operation of the instrument and will be evaluated on the soundness and completeness of the approach and the probability that the management team can assure success of the investigation. The soundness and completeness of the approach will be evaluated by reviewing the organizational structure (including roles, responsibilities, accountability, and decision making processes) and the

processes, plans, and strategies the team will use to manage the various elements of the investigation. Factors in this evaluation will include the degree to which the following are demonstrated: clear lines of authority, clean interfaces, prudent scheduling and cost control mechanisms, review processes, and demonstrated awareness of all necessary management processes. Factors in the evaluation of the probability for success of the investigation will include the experience, expertise, and commitment of key personnel and the organizations to which they are attached, the adequacy of facilities and equipment proposed for the investigation, the adequacy of the team's approach to risk management, and the adequacy of the management and control mechanism. Innovative management processes and plans will be rewarded if proven to be sound.

6.2.4 Competence and Experience of the Investigator, Investigation Team, and Sponsoring Institution(s)

The competence and relevant experience of the proposer and any proposed investigative team will be evaluated as an indication of their ability to carry the investigation to a successful conclusion and the commitment of the proposer's institution, as measured by the willingness of the institution to provide the necessary support (logistics, facilities, etc.) to ensure that the investigation can be completed satisfactorily. IDS proposers will be evaluated on whether they have demonstrated a broad knowledge of gamma-ray astronomy, high-energy physics, and the related scientific disciplines that can have a bearing on the scientific success of GLAST.

6.3 Selection Factors

As described in Section 6.1, the results of the proposal evaluations based on the above criteria and categorizations will be considered in the selection process. The overriding consideration for the final selection of proposals submitted in response to this AO will be to maximize the scientific return from the GLAST mission within the available budget. E/PO will be one of the other factors to be considered in determining the relative merits of closely competing proposals in subsequent stages of the selection process.

6.4 Implementation Procedures

6.4.1 Notification of Selection

Following selection, appropriate letters of selection or rejection will be sent to all proposers. All proposers will be offered a debriefing concerning the strengths and weaknesses of their proposals as described in Section 6.1.

6.4.2 Award Administration and Funding

All selected proposers will be contacted immediately in order to establish a funding mechanism as quickly as possible. In particular, it is expected that all selected members of the GLAST SWG will attend a first meeting of the SWG within approximately four weeks of selection notification.

Should a non-U.S. proposal be selected, NASA's Office of External Relations, Space Science and Aeronautics Division, will arrange with the non-U.S. sponsoring agency for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency will each bear the cost of discharging their respective responsibilities. Depending on the nature and extent of the proposed cooperation, these arrangements may entail a letter of notification by NASA with a subsequent exchange of letters between NASA and the sponsoring governmental agency or a formal Agency-to-Agency Memorandum of Understanding (MOU).

6.4.3 Confirmation of Investigations

As discussed previously in Section 1.1, the investigations selected under this proposal will be implemented in two phases. The first phase will be for definition (formulation) only. The second phase will be for implementation, flight operations, and data analysis. Progress from formulation to implementation is predicated on the successful completion of a NASA Non-advocate Review (NAR). Based on the results of the NAR, the NASA Associate Administrator for Space Science will confirm the participation as originally selected, direct modification to meet project schedule and funding limitations, or terminate the proposed participation. At that time, firm commitments to performance specification, costs, schedule, and scope will be established.

7.0 CONCLUSION

The Gamma Ray Large Area Space Telescope will be the premier high-energy gamma-ray astrophysical observatory of the next decade. The science objectives of GLAST are broad ranging and address many of the most exciting areas of current astrophysical research. We invite your participation in this important and exciting scientific program.

Alan N. Bunner
Science Program Director
Structure and Evolution of the Universe

Edward J. Weiler
Associate Administrator
for Space Science

APPENDIX A

GENERAL INSTRUCTIONS AND PROVISIONS

I. INSTRUMENTATION AND/OR GROUND EQUIPMENT

By submitting a proposal, the investigator and institution agree that NASA has the option to accept all or part of the offeror's plan to provide the instrumentation or ground support equipment required for the investigation, or NASA may furnish or obtain such instrumentation or equipment from any other source as determined by the selecting official. In addition, NASA reserves the right to require use of Government instrumentation or property that subsequently becomes available, with or without modification, that meets the investigative objectives.

NOTICE TO ALL OFFERORS: In the event that a Principal Investigator employed by NASA is selected under this Announcement of Opportunity (AO), NASA will award prime contracts to non-Government participants, including co-investigators, hardware fabricators, and service providers, who are named members of the proposing team, as long as the selecting official specifically designates the participant(s) in the selection decision. Refer to Section G of Appendix B of this AO for proposal information which the selecting official will review in determining whether to incorporate a non-Government participant in the selection decision. Each NASA contract with a team member selected in this manner will be supported by an appropriate justification for other than full and open competition, as necessary.

II. TENTATIVE SELECTIONS, PHASED DEVELOPMENT, PARTIAL SELECTIONS, AND PARTICIPATION WITH OTHERS

By submitting a proposal, the investigator and the organization agree that NASA has the option to make a tentative selection pending a successful feasibility or definition effort. NASA has the option to contract in phases for a proposed experiment, and to discontinue the investigative effort at the completion of any phase. NASA may desire to select only a portion of the proposed investigation and/or that the individual participates with other investigators in a joint investigation. In this case, the investigator will be given the opportunity to accept or decline such partial acceptance or participation with other investigators prior to a NASA selection. Where participation with other investigators as a team is agreed to, one of the team members will normally be designated as its leader or contact point. NASA reserves the right not to make an award or cancel this AO at any time.

III. NONDOMESTIC PROPOSALS

The guidelines for proposals originating outside of the United States are the same as those for proposals originating within the United States, except that the additional conditions described in Section 4.8 shall also apply.

IV. TREATMENT OF PROPOSAL DATA

It is NASA policy to use information contained in proposals and quotations for evaluation purposes only. While this policy does not require that the proposal or quotation bear a restrictive notice, offerors or quoters should, in order to maximize protection of trade secrets or other information that is commercial or financial and confidential or privileged, place the following notice on the title page of the proposal or quotation and specify the information, subject to the notice by inserting appropriate identification, such as page numbers, in the notice. In any event, information (data) contained in proposals and quotations will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

RESTRICTION ON USE AND DISCLOSURE OF
PROPOSAL AND QUOTATION INFORMATION (DATA)

> The information (data) contained in (insert page numbers or other identification) of this proposal or quotation constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed for other than evaluation purposes; provided, however, that in the event a contract is awarded on the basis of this proposal or quotation, the Government shall have the right to use and disclose this information (data) to the extent provided in the contract. This restriction does not limit the Government's right to use or disclose this information (data), if obtained from another source without restriction.

V. STATUS OF COST PROPOSALS

Submission of a Standard Form (SF) 1411 Contract Pricing Proposal Cover Sheet is required if the proposed amount is $500,000 or more. The investigator's institution agrees that the cost proposal submitted in response to the Announcement is for proposal evaluation and selection purposes, and that, following selection and during negotiations leading to a definitive contract, the institution may be required to resubmit or execute all certifications and representations required by law and regulation.

VI. LATE PROPOSALS

The Government reserves the right to consider proposals or modifications thereof received after the date indicated for such purpose, if the selecting official deems it to offer NASA a significant technical advantage or cost reduction. (See NFS 18-15.412.)

VII. SOURCE OF SPACE INVESTIGATIONS

Investigators are advised that candidate investigations for space missions can come from many sources. These sources include those selected through the AO, those generated by NASA in-house research and development, and those derived from contracts and other agreements between NASA and external entities.

VIII. DISCLOSURE OF PROPOSALS OUTSIDE THE GOVERNMENT

NASA may find it necessary to obtain proposal evaluation assistance outside the Government. Where NASA determines it is necessary to disclose a proposal outside the Government for evaluation purposes, arrangements will be made with the evaluator for appropriate handling of the proposal information. Therefore, by submitting a proposal, the investigator and institution agree that NASA may have the proposal evaluated outside the Government. If the investigator or institution desires to preclude NASA from using an outside evaluation, the investigator or institution should so indicate on the cover. However, notice is given that if NASA is precluded from using outside evaluation, it may be unable to consider the proposal.

IX. EQUAL OPPORTUNITY

For any NASA contract resulting from this solicitation, the clause at FAR 52.222-26, "Equal Opportunity," shall apply.

X. PATENT RIGHTS

A. For any NASA contract resulting from this solicitation awarded to other than a small business firm or nonprofit organization, the clause at NFS 18-52.227-70, New Technology, shall apply. Such contractors may, in advance of a contract, request waiver of rights as set forth in the provision at NFS 18-52.227-71, Requests for Waiver of Rights to Inventions.

B. For any NASA contract resulting from this solicitation awarded to a small business firm or nonprofit organization, the clause at FAR 52.227-11, Patent Rights -- Retention by the Contractor (Short Form), (as modified by NFS 18-52.227-11) shall apply.

XI. RIGHTS IN DATA

Any contract resulting from this solicitation will contain the Rights in Data - General clause: FAR 52.227-14.

XII. SMALL AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING

A. Offerors are advised that, in keeping with Congressionally mandated goals, NASA seeks to place a fair portion of its contract dollars, where feasible, with small disadvantaged business concerns, women-owned small business concerns, Historically Black Colleges and Universities, and minority educational institutions, as these entities are defined in 52.219-8 and in 52.226-2 of the FAR. For this Announcement of Opportunity, NASA has established a recommended goal of 8 percent for the participation of these entities at the prime and subcontract level. This goal is stated as a percentage of the total contract value. NASA encourages all offerors to meet or exceed this goal to the maximum extent practicable and to encourage the development of minority businesses and institutions throughout the contract period. Offerors will be evaluated on the proposed goal for participation of the entities listed above in comparison with the 8 percent goal and on the methods for achieving the proposed goal.

B. Offerors are advised that for NASA contracts resulting from this solicitation which offer subcontracting possibilities, exceed $500,000, and are with organizations other than small business concerns, the clause FAR 52.219-9 shall apply. Offerors who are selected under this AO will be required to negotiate subcontracting plans which include subcontracting goals for small, small disadvantaged, and women-owned small business concerns. Note that these specific subcontracting goals differ from the 8 percent goal described in paragraph A above, and need not be submitted with the proposal. Failure to submit and negotiate a subcontracting plan after selection shall make the offeror ineligible for award of a contract.

APPENDIX B

DETAILED GUIDELINES FOR PROPOSAL PREPARATION

The following guidelines apply to the preparation of proposals in response to this GLAST AO. The material presented is a guide for the prospective proposer and is not intended to be all encompassing. The proposer should, however, provide information relative to those items applicable, as well as other items required by the AO. In the event of an apparent conflict between the guidelines in this Appendix and those contained within the body of the AO, those within the AO shall take precedence.

GENERAL GUIDELINES

All documents must be typewritten in English, use metric and standard astronomical units, and be clearly legible. Except as noted below, submission of proposal material by facsimile (fax), electronic media, videotape, or removable computer media (e.g., floppy disk), is not acceptable. In evaluating proposals, NASA will only consider printed material. Proposals may not reference a World Wide Web site for any data or material needed to understand or evaluate the proposal.

In addition to providing the data in the printed proposals, proposers must submit a copy of the text of their proposal on either 3.5-inch diskettes or a 100 MB Zip disk that is to accompany their original, signed proposal. The text of the proposal must be in text-only format while the budget data, including the headings for the rows and columns, must be in tab-delimited text format in files separate from the text of the proposal. The diskettes and Zip disks may be either PC-compatible or Macintosh-compatible and must be labeled with the title of the proposal and the PI's name.

In order to allow for recycling of proposals after the review process, all proposals and copies must be submitted on plain white paper only (e.g., no cardboard stock or plastic covers, no colored paper, etc.). Photographs and color figures are permitted if printed on recyclable white paper only. The original signed copy (including cover page and non-U.S. endorsements) must be bound in a manner that makes it easy to disassemble for reproduction. A three-ring binder is acceptable for the original signed copy. The other copies for review must be stapled, or use a glue binding or spiral notebook, but not otherwise hard bound. Except for the original, two-sided copies are preferred. Every side upon which printing appears will be counted against the page limits.

Single- or double-column format is acceptable. In complying with the page limit, no page may contain more than 50 lines of text and the type font must not be smaller than 12-point (i.e., less than or equal to 15 characters per inch). Figure captions must not be smaller than 12 point. Smaller font is allowed within figures and in the cost table. Proposals may include no more than four fold out pages (28 x 43 cm; i.e., 11 x 17 inches). All pages other than fold out pages shall be 8.5 x 11 inches or A4 European standard.

Proposals must be organized with readily identified sections corresponding to Sections A through J given below. Table B-1 and Table B-2 give restrictions on page count for the two types of proposals solicited by this AO.

INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS

The proposal must consist of two volumes: Scientific Investigation and Technical Proposal, and Management and Cost Proposal. The Scientific Investigation and Technical Proposal (Volume 1) must consist of a main body and optional appendices. All pertinent information necessary for a sound scientific and technical assessment of the proposed investigation must be contained in the 70 pages or less of the main body of the proposal. No appendices other than those in Table B-1 are permitted.

The Management and Cost Proposal (Volume 2) must summarize the management approach and the estimated total investigation cost for all phases of the investigation, including data analysis. Cost Proposals are required for U.S. investigations only. There are no page limits on the Management and Cost Proposal, but small size is encouraged.

TABLE B-1: PAGE LIMITS FOR INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS

Vol.	Section	Page Limits
1	Cover Page/Proposal Summary	Per printout from web site
1	Table of Contents	2
1	Executive Summary (including 2 page Fact Sheet)	6
1	Science Investigation and Technical Description	70
1	Education, Public Outreach, New Technology, and Small Disadvantaged Business Plan	6
1	Appendices: (no others permitted) Resumes (2 pages for PI, 1 page for each other investigator) Letter(s) of Endorsement NASA PI Proposing teams (1 page) Draft International Agreement(s) Reference List (optional) Acronyms List (optional)	no page limit, but small size encouraged
2	Management and Cost Plan	no page limit
2	Appendix: Statement(s) of Work (SOW)	no page limit

INTERDISCIPLINARY SCIENTIST PROPOSALS

The proposal must consist of two parts, Scientific Investigation Proposal and Cost Proposal, bound in a single volume. The Scientific Investigation Proposal (Part 1) must consist of a main body and optional appendices. All pertinent information necessary for a sound scientific assessment of the proposed investigations must be contained in the 18 pages or less of the main body of the proposal. No appendices other than those in Table B-2 are permitted.

The Cost Proposal (Part 2) must summarize the estimated total investigation cost for all phases of the investigation, including data analysis. Cost Proposals are required for U.S. investigations only. There are no page limits on the Cost Proposal.

TABLE B-2: PAGE LIMITS FOR INTERDISCIPLINARY SCIENTIST PROPOSALS

Part	Section	Page Limits
1	Cover Page/Proposal Summary	Per printout from web site
1	Table of Contents	1
1	Executive Summary (Fact Sheet optional)	3
1	Science Investigation	18
1	Appendices: (no others permitted) Resumes (2 pages for PI) Letter(s) of Endorsement NASA PI Proposing teams (1 page) Reference List (optional) Acronyms List (optional)	no page limit, but small size encouraged
2	Cost Plan	no page limit

A. COVER PAGE/PROPOSAL SUMMARY

All proposers responding to this AO must submit an integrated Cover Page/Proposal Summary that contains important required information. The form for the electronic submission of the Cover Page/Proposal Summary is located at the World Wide Web address <http://props.oss.hq.nasa.gov/>. Proposers who experience difficulty in using this Web format should contact Debra Tripp (E-mail: deb.tripp@hq.nasa.gov) for assistance. In addition to an electronic submission of this proposal, a hard copy printout of the completed Cover Page/Proposal Summary form must be included with each copy of the proposal. It is NASA's intent to enter the Summaries of all selected investigations for its various programs

into a publicly accessible data base. Therefore, the Proposal Summary, which is limited to 2000 characters (about one-half page), may not contain any proprietary or confidential information that the submitter wishes to protect from public disclosure. This form must be accessed in time for a hardcopy version of the form to receive the required institutional endorsements for submission with the hardcopy submissions.

B. TABLE OF CONTENTS

The proposal shall contain a table of contents, which will not be counted against the page limit. This table of contents should parallel the outlines provided below.

C. EXECUTIVE SUMMARY, INCLUDING FACT SHEET

The Executive Summary must provide an overview of the investigation, including its scientific objectives, instrumentation, operational approach, educational and societal opportunities, management plan, and cost plan.

The Fact Sheet provides a brief summary of the proposed investigation and must be included in IPI proposals. The information conveyed on the Fact Sheet must include the following: science objectives (including the importance of the science to the NASA space science program and the GLAST mission objectives), science payload, key technical characteristics, management of the investigation (including teaming arrangements), schedule, and cost estimate. Other relevant information, including figures or drawings, may be included at the proposer's discretion. The Fact Sheet is restricted to two pages (preferably a double-sided single sheet).

D. SCIENCE INVESTIGATION AND TECHNICAL DESCRIPTION

This section, which is the main body of the proposal must cover the scientific objectives of the proposed investigation, the quantity and quality of data needed in order to perform the investigation, instrument operations needed to acquire the data (as related to the nominal mission profile), how the data will be analyzed, and how the data products will be used to achieve the scientific objectives. For IPI proposals, the description must include how the proposed instrumentation will acquire the needed data. For IDS proposals the description must include how the investigation will be performed, given data which meets the parameters specified in the GLAST Science Requirements Document.

1. Scientific Goals and Objectives. This section must consist of a discussion of the goals and objectives of the investigation, the value of the investigation to the Structure and Evolution of the Universe theme of the NASA Office of Space Science, high energy astrophysics, and the GLAST mission. This section must also include a summary of how the proposed investigation addresses the science requirements as described in the Science Requirements Document.

2. Science Implementation. This section must describe how the investigation will accomplish its goals and objectives.

IDS proposals must describe the approach to be used for their scientific investigation. This should include the analysis required to be done, tools needed to perform the analysis and the acquisition of these tools, algorithm and software development, required hardware, staffing, and the specific activities to be performed during the Formulation phase (phase A/B), Implementation phase (C/D), and Operations phase (E).

The remainder of this section applies to IPI proposals only.

The measurements to be taken in the course of the investigation, the data to be returned, and the approach that will be taken in analyzing the data to achieve the scientific objectives must be discussed. The quality of the data to be returned (resolution, coverage, measurement precision, etc.) and the quantity of data to be returned must be described. The method proposed for deriving the details of the instrument response, including the calibration of the instrument both preflight and on-orbit must be included. The relationship between the data products generated and the scientific goals and objectives must be described, as should the expected results.

This section must fully describe the instrumentation and the rationale for why this instrumentation is used. It must identify the instrument systems, including their physical characteristics (e.g., mass, power, volume) and requirements, as well as the flight software.

A preliminary description of the instrument design with a block diagram showing the instrument systems and their interfaces must be included, along with a description of the estimated performance of the instrument, including any performance margins. Performance characteristics must be related to the measurement and investigation objectives as stated in the proposal. It must explain how the instrument design will achieve the stated performance and describe the technical justification and rationale for why the instrument will perform as described.

The instrument background rejection scheme must be described in detail, with particular attention to the instrument data system hardware and software. Supporting data to justify the background rejection scheme should be presented.

A traceability matrix showing how the proposed instrument design is derived from the stated objectives, requirements, and constraints of the proposed investigation, must be provided.

There must also be a description of the resources required by the instrumentation (e.g., mass, power, data rate, volume), the margins planned for these resources, and a comparison of the requirements to the limits on the resources given in the GLAST Instrument to Spacecraft Interface Requirements Document (see Appendix C). The description should include how the instrumentation will meet all the interface requirements to the spacecraft, as described in this document.

The heritage of various parts of the instrumentation, supporting systems, and software must be described. For heritage at the component level, the amount of departure from "build-to-print of qualified component" must be quantified. The past use of the component must be described along with a summary of how the proposed use of the component will differ from the past use. Also, the environment of past use must be described along with a summary of how the environment of this proposed use will differ from the environment of past use. The status of the source of heritage must also be given. If the source of heritage has not completed a qualification program, the heritage must be identified as "potential heritage" even though the level of heritage may be high. For flight hardware components with high heritage or high potential heritage, compare the mass, power, and volume of the proposed component with the mass, power, and volume of the source of heritage. For claims of heritage at higher levels of integration, similar information must be included in the description.

For any level of heritage claimed, cost information about the referenced sources of heritage will be required in the section on cost-estimating methodology.

The overall concept for performing instrument operations at the instrument operations center, must be described. In addition, the strategy for acquiring, analyzing and managing data must be described, including the necessary algorithm and software development, a description of the data products to be produced, and a description of the required hardware for data analysis and instrument operations. Staffing plans must be discussed, including the rationale for those plans. The proposed method for supplying the data to the science operations center for public and Guest Investigator access, along with the details of the software and documentation to accompany the disseminated data must be supplied. The IPI proposer should bear in mind his or her responsibility to provide instructions on the use and operation of his or her instrument for outside observers. In writing this section, the nominal mission profile from section 4.2.3 must be addressed.

The relationship between the proposed scientific objectives, the data required to achieve those objectives, and the instrument performance and instrument operations needed to obtain those data must be quantitatively presented in the proposal in a clear and unambiguous way.

This section must identify the investigation science team, and the roles and responsibilities of that team must be described in detail. The capabilities and experience of all members of the proposed science team must be described. In addition, the role of each science team member in the investigation must be explicitly defined.

This section must also identify a series of descope options that save up to 10% of developmental costs to NASA, and that ultimately result in a minimum acceptable data and scientific return for the investigation (the "Performance Floor"), below which the investigation would not be worth pursuing. The value of the science in advancing space science and high energy astrophysics at the Performance Floor must be discussed. A description of the descope options available to the team, their phasing, their savings to the program, and their effect on meeting the scientific objectives of the investigation, as the investigation is descoped to the Performance Floor, must be discussed. The descope plan must be appropriate for a variety of circumstances, including recovery from developmental problems as well as a reduction in the NASA funds available for development. The plan should identify the portion of the descope funds that would be available to cover the cost of a secondary instrument.

3. Technical Approach (Instrument Principal Investigator proposals only). This section includes the approach to designing, developing, integrating, testing and operating the flight instrumentation and its supporting systems.

This section must begin with an overview that puts the general plans in the context of the approach for managing the performance and reliability of flight instrumentation, its supporting systems, and the software. The approach for ensuring performance must be given, covering at the least:

- Potential risks to the proposed investigation and plans for mitigating those risks;
- Technology development plans and back-up plans if the technologies do not meet development needs; and
- Strategy for minimizing process variability and product variability.

Fabrication processes must be described, including the team's "in-house" fabrication capability and the availability of capable vendors. The approach, techniques and facilities planned for assembly, integration and test of the flight instrumentation, supporting systems, and software must be given for the development of the instrumentation, for physical and analytical integration with the spacecraft, and for launch operations phase.

A preliminary schedule for manufacturing, integration, and test activities must be included. A description of the planned end items, including engineering and qualification hardware, must be included.

The section must include a description of the plans for design and systems engineering of the flight instrumentation, supporting systems, and software. The approach to working with the spacecraft vendor and Project team must be given, particularly in terms of systems engineering and mission design activities.

This section must describe the process by which success of the investigation is assured and safety is achieved. This section must describe assurance and safety plans of the investigation, including plans for reviews, problem/failure resolution, hazard mitigation, inspections, quality assurance, reliability, parts selection and control, safety processes, and software validation activities, compatible with industry best practices and ISO 9000 quality standards. The proposed reliability plans and parts selection must support the mission lifetime. The proposal must identify workmanship standards to be used. Typical standards used in NASA programs are listed in Appendix C. The safety program must meet the range safety requirements as specified in the range safety document in Appendix C.

4. Phase A/B Development Technical Definition Plan (Instrument Principal Investigator proposals only). This section must describe the proposer's plan for updating the instrument design to reach the maturity level required for a PDR. This includes updating any existing hardware to a prototype, and supporting the flight of the prototype on a high-altitude scientific balloon or some other proposed effective means of demonstrating the ability of the instrument to handle the multi-component background encountered in a space flight environment. If an alternative to a balloon flight is proposed, the proposal must clearly address how the proposed method will be a sufficient demonstration. This section must identify the trades planned, the process for conducting and documenting those trades, and the process for interaction between the IPI team members.

E. EDUCATION, PUBLIC OUTREACH, NEW TECHNOLOGY, AND SMALL DISADVANTAGED BUSINESS PLAN (INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS ONLY)

The education, public outreach, new technology, and small disadvantaged business section must provide a summary of the benefits expected to be offered by the proposal beyond the proposed scientific benefits. This plan must reflect the proposer's commitment to achieving the goals of the OSS education and public outreach strategy as reflected in the Implementation Plan for that strategy, participation of small disadvantaged business, and the use of new technology in the implementation of the investigations. Further information on the OSS broad approach to education and outreach can be found in *Implementing the Office of Space Science (OSS) Education and Outreach Strategy* (see section 4.3.1). Appendix E includes further information and assistance on preparing and submitting an E/PO proposal. Guidance on the use of new technology in investigations can be found in the *OSS Integrated Technology Strategy* (see section 4.3.2).

F. APPENDICES

The following additional information is required to be supplied with the IPI or IDS proposal, as indicated in Tables B-1 and B-2. This information can be included as Appendices to the proposal and, as such, will not be counted within the specified page limit.

1. Resumes. Provide resumes for all key personnel identified in the Management section.

2. Letters of Endorsement. Letters of endorsement must be provided from all organizations participating in the investigation. Letters of endorsement should be signed by both the lead representative from each organization represented on the team, and by institutional and Government officials authorized to commit their organizations to participation in the proposed investigation.

3. NASA Principal Investigator Proposing Teams. Proposals submitted by NASA employees as Principal Investigators must contain the following information concerning the process by which non-Government participants were included in the proposal. The proposal should (i) indicate that the supplies or services of the proposed non-Government participant(s) are available under an existing NASA contract; (ii) make it clear that the capabilities, products, or services of these participant(s) are sufficiently unique to justify a sole source acquisition; or (iii) describe the open process that was used for selecting proposed team members. While a formal solicitation is not required, the process cited in (iii) above should include at least the following competitive aspects: notice of the opportunity to participate to potential sources; submissions from and/or discussions with potential sources; and objective criteria for selecting team members among interested sources. The proposal should address how the selection of the proposed team members followed the objective criteria and is reasonable from both a technical and cost standpoint. The proposal should also include a representation that the Principal Investigator has examined his/her financial interests in or concerning the proposed team members and has determined that no personal conflict of interest exists. The proposal must provide a certification by a NASA official superior to the Principal Investigator verifying the process for selecting contractors as proposed team members, including the absence of conflicts of interest.

4. International Agreement(s) (IPI Proposals Only). Draft International Agreement(s) are required for all non-U.S. partners in the investigation.

5. Reference List. Proposals may provide, as an appendix, a list of reference documents and materials used in preparing the proposal. This is distinct from the citation reference list which must appear in the main body of the proposal. The documents and materials themselves cannot be submitted except as a part of the proposal. However, it should not be necessary for a reviewer to read any of these references to understand the proposal; i.e., the proposal text must be complete on its own merits.

6. Acronyms List. Proposals may provide a list of acronyms.

G. MANAGEMENT PLAN (INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS ONLY)

This section must summarize the investigator's proposed management approach and essential management functions, putting it in the context of the work to be accomplished. A Work Breakdown Structure (WBS) must be presented that covers the entire effort of the investigation. The structure of the WBS should be consistent with the plans set forth in the Technical Approach and Management sections of the proposal and the Statement of Work provided as an Appendix to the proposal.

The management processes that the investigator team proposes, including the relationship between organizations and key personnel must be discussed, and include the following, as applicable: systems engineering and integration; requirements development; configuration management; schedule management; team member coordination and communication; performance measurement; and resource management.

The management organization (including an organization chart) and decision-making process must be described, and the teaming arrangement must be discussed. The roles and responsibilities of team members, including contributors, and institutional commitments must be discussed. Unique capabilities that each team member organization brings to the team, as well as previous experience with similar systems and equipment, must be addressed. The contractual and financial relationships between team partners must be discussed. The specific roles and responsibilities of the Principal Investigator and Instrument Project Manager must be described. The acquisition strategy for hardware and software must be described. Major facilities and equipment plans should be identified.

An investigation schedule covering all phases of the investigation must be provided, along with a more detailed, development schedule covering contract start through end of mission. The development schedule must include, as a minimum, major project review dates; instrument development; long lead procurements; instrument-to-spacecraft integration and test; launch vehicle integration; launch operations; postlaunch checkout of the instrumentation; and operations. Schedule reserve in the development schedule must be clearly identified, and the relationship between the work and the schedule must be explained.

This section must describe the approach to, and plans for, risk management to be taken by the team. Particular emphasis must be placed on identifying elements of risk, including new technologies, and describing how they will be managed to ensure successful accomplishment of the investigation within cost and schedule constraints. Investigations dependent on new technology will not be penalized for risk if a credible plan including cost and schedule for implementing the new technology is shown, and adequate backup plans are described to ensure success of the investigation. Management strategies must be described for the control,

allocation, and release of technical, cost, and schedule reserves and margins. Identify the latest possible dates at which descope options may be implemented and the procedure by which they would be accomplished. Any risks associated with multi-institutional management of instrument subsystems must be addressed, along with plans for mitigating those risks.

This section must clearly describe the approach to reporting progress to the Government and the reviews the Government is invited to attend to provide independent oversight. It must include quarterly reviews to NASA (possibly in conjunction with other institutional partners). The process, including the individual or organization responsible for reporting integrated cost, schedule, and technical performance must be discussed.

H. STATEMENT(S) OF WORK (INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS ONLY)

Provide draft Statement(s) of Work for all potential contracts with NASA. These Statement(s) of Work must (as a minimum) be for each contract option (i.e., Formulation (Phase A/B), Implementation (Phase C/D/E)) and clearly define all proposed deliverables (including science data) for each option, potential requirements for Government facilities and/or Government services, and a proposed schedule for the entire investigation.

I. COST PLAN

Note: In the ensuing discussion, IDS proposers should disregard references to the WBS, and do not need to fill in Table B-4 (they do need to fill in Table B-3).

The cost plan must provide information on the anticipated costs for all phases of the investigation. These costs shall be consistent with the program funding requirements described in section 4.6 of this AO. A detailed cost proposal is required for the formulation phase (Phase A/B), for the implementation phase (Phase C/D), operations phase (Phase E), and for investigation totals. The methodology used to estimate the cost -- for example, specific cost model, past performance, or cost estimating relationships from analogous investigations -- must be discussed. Budget reserve strategy, including budget reserve levels as a function of mission phase, must be discussed. Please provide assumptions used in developing cost estimates to help facilitate the reviewers' understanding of proposed cost estimates. Also, the proposal must provide cost information (in FY 1999, fixed year dollars) about any items that provide heritage to the investigation.

It is anticipated that during the period of performance of the proposed investigation, NASA will implement full cost accounting for NASA Centers. To plan for this, proposers using NASA services must provide two cost proposals for the NASA portion. The first is in the non-full cost accounting mode, which will be used to evaluate against the available funds for

this investigation. This must include the nominal tax rate for Civil Service labor charged by the institution for their program support. The second is for NASA's estimation purposes, and must fully cost and account for all direct and indirect costs associated with the work performed at NASA Centers, including all Civil Service labor and the cost for use of Government facilities and equipment.

Each budget must be presented twice, once in real year dollars and once in fixed, Fiscal Year 1999 dollars. Table B-5 gives the inflation model that should be used in converting from real year dollars to Fiscal Year 1999 dollars.

The inflation index provided in Table B-5 should be used to calculate all real-year dollar amounts, unless an industry forward pricing rate is used. If something other than the provided inflation index is used, the rates used should be documented.

1. Formulation Phase (Phase A/B) Cost Proposal. This section provides a detailed cost proposal for performing the Phase A/B study. Detailed plans for the study must be described, but reference may be made to the Technical Approach and Management sections of the proposal as appropriate.

    a. Contract Pricing Proposal Cover Sheet. A completed Contract Pricing Proposal Cover Sheet, SF 1411, must be included with the proposal for the Phase A/B study. The SF 1411 must be signed by the proposer's authorized representative.

    b. Workforce Staffing Plan. Provide a workforce staffing plan that is consistent with the Work Breakdown Structure. This workforce staffing plan should include all team member organizations and should cover all management, technical (scientific and engineering), and support staff. The workforce staffing plan must be phased by fiscal year. Time commitments for the Principal Investigator, Instrument Project Manager, and other key personnel must be clearly shown.

    c. Formulation Phase (Phase A/B) Time-Phased Cost Summary. Provide a summary of the total Phase A/B costs consistent with Table B-4. The Phase A/B cost summary must be developed consistent with the Work Breakdown Structure and must include all costs to NASA, along with all contributed costs. The Phase A/B time phased cost summary must be phased by fiscal year.

    d. Cost Elements Breakdown. To evaluate effectively the Phase A/B cost proposals, NASA requires costs and supporting evidence stating the basis for the estimated costs. The proposal must include, but is not limited to:

i. Direct Labor.
   (1) Explain the basis of labor-hour estimates for each of the labor classifications.
   (2) State the number of productive work-hours per month.
   (3) Provide a schedule of the direct labor rates used in the proposal. Discuss the basis for developing the proposed direct labor rates for the team member organizations involved.
   (4) If Civil Servant labor is to be used in support of the Phase A/B study, but is not to be charged directly to the investigation, then this labor must be considered as a contribution by a domestic partner, subject to the same restrictions as other contributions by domestic or foreign partners. A discussion of the source of funding for the Civil Servant contributions must be provided.

ii. Direct Material. Submit a summary of material and parts costs for each element of the WBS.

iii. Subcontracts. Identify each effort (task, item, etc. by WBS element) to be subcontracted, and list the selected or potential subcontractors, locations, amount budgeted/proposed, and types of contracts.

iv. Other Direct Costs.
   (1) Travel, Relocation, and Related Costs. Provide a summary of the travel and relocation costs including the number of trips, duration, and purpose of the trips.
   (2) Computer. Provide a summary of all unique computer-related costs.
   (3) Consultants. Indicate the specific task area or problem requiring consultant services. Identify the proposed consultants (if known), and state the associated costs.
   (4) Other. Explain and support any other direct costs included in the Phase A/B proposal in a manner similar to that described above.

v. Indirect Costs.
   (1) List all indirect expense rates for the team member organizations. Indirect expense rates (in the context of this AO) include labor overhead, material overhead, general and administrative (G&A) expenses, and any other cost proposed as an allocation to the proposed direct costs.
   (2) If the proposal includes support services for which off-site burden rates are used, provide a schedule of the off-site burden rates.
   (3) Discuss the fee arrangements for the major team partners.

2. Implementation Phase (Phase C/D) Cost Estimate. This section provides a cost estimate for performing the Implementation Phase (Phase C/D) portion of the investigation. The Phase C/D cost estimates should correlate with the plans set forth in the Science, Technical Approach, and Management sections of the proposal. In completing this section, the following guidelines will apply:

    a. Workforce Staffing Plan. Provide a workforce staffing plan (including civil service) that is consistent with the Work Breakdown Structure. This workforce staffing plan must include all team member organizations and must cover all management, manufacturing, technical (scientific and engineering), and support staff. The workforce staffing plan must be phased by fiscal year. Time commitments for the Principal Investigator, Instrument Project Manager, and other key personnel must be clearly shown.

    b. Phase C/D Time-Phased Cost Summary. Provide a summary of the total Phase C/D costs consistent with Table B-4. The Phase C/D cost summary must be developed consistent with the Work Breakdown Structure and should include all costs to NASA, along with all contributed costs. The Phase C/D time phased cost summary must be phased by fiscal year.

3. Operations and Data Analysis (Phase E) Cost Estimate. This section provides a cost estimate for performing the operations and data analysis, as required by this AO, for Phase E. Reference may be made to the Technical Approach and Management sections of the proposal. In completing this section, the guidelines for Phase C/D apply.

4. Total Cost Estimate. This section must summarize the estimated costs to be incurred in Phases A through E including: Formulation Phase (Phase A/B), Implementation Phase (Phase C/D), and Operations and Data Analysis Phase (Phase E). The total mission cost estimate must be developed consistent with the Work Breakdown Structure.

    A summary of the Total Cost time-phased by fiscal year must be included in the format shown in Table B-3. Total Mission Costs must be summarized in the last column of this table. Assets provided as contributions by international or other partners must be included, and clearly identified, as separate line items.

TABLE B-3
TOTAL COST FUNDING PROFILE TEMPLATE
(Costs* in Real Year Dollars and Fiscal Year 1999 Dollars)

Item	FY00	FY01	FY02	FY03	FY04	FY05	...	FY10	Total
Phase A/B	$	$	$	$	$	$	$	$	$
- Organization A									
- Organization B									
- etc.									
Phase C/D	$	$	$	$	$	$	$	$	$
- Organization A									
- Organization B									
- etc.									
Phase E	$	$	$	$	$	$	$	$	$
- Organization A									
- Organization B									
- etc.									
Other (specify)	$	$	$	$	$	$	$	$	$
Cost to NASA (Total)	$	$	$	$	$	$	$	$	$
Additional Contributions by Organization (Foreign or Domestic) to:									
Total Phase A/B	$	$	$	$	$	$	$	$	$
- Organization A									
Total Phase C/D	$	$	$	$	$	$	$	$	$
- Organization A									
Total Phase E	$	$	$	$	$	$	$	$	$
- Organization A									
Other (specify)	$	$	$	$	$	$	$	$	$
Contributed Costs (Total)	$	$	$	$	$	$	$	$	$
						Totals			$

* Costs should include all costs including fee

TABLE B-4
TIME PHASED COST BREAKDOWN BY WBS AND MAJOR COST CATEGORY
(Costs in Real Year Dollars and Fiscal Year 1999 Dollars)

WBS/Cost Category Description	FY00	FY01	Total
WBS 1.0 Management			
WBS 2.0 Instrument			
WBS 2.1 Subsystem A			
WBS 2.2 Subsystem B			
etc.			
Total Subcontract Costs	$	$	$
WBS # and Description			
:			
Etc.			
Total Materials & Equipment Cost	$	$	$
WBS # and Description			
:			
Etc.			
Total Reserves	$	$	$
WBS # and Description			
:			
etc.			
Total Other Costs	$	$	$
WBS # and Description			
:			
etc.			
Fee			
Other (Specify)			
Total Contract Cost	$	$	$

Total Contributions (Foreign or Domestic)	$	$	$
Organization A:			
WBS # and Description			
:			
etc.			
Organization B:			
WBS # and Description			
:			
etc.			

TOTAL COST FOR TIME PHASE	$	$	$

TABLE B-5

NASA NEW START INFLATION INDEX

Fiscal Year	1999	2000	2001	2002	2003	2004	2005
Inflation Rate	0	4.1%	3.9%	3.9%	3.9%	3.9%	3.9%
Cumulative Inflation Index	1.0	1.041	1.082	1.124	1.168	1.213	1.260

Use an inflation rate of 3.9% for years beyond 2005.

APPENDIX C

BIBLIOGRAPHY OF RELEVANT REPORTS AND APPLICABLE DOCUMENTS

The following reference documents are available electronically via the Internet, as well as paper copy. Proposers are requested to access the documents electronically where possible. Only limited paper copies of documents are available. It is incumbent upon the proposer to ensure that the documents used in proposal preparation are of the date and revision listed in the Announcement of Opportunity or this Appendix.

Requests for paper copies should be submitted in writing to:

GLAST Bibliography
GLAST Project Office
Code 740.2
Goddard Space Flight Center
National Aeronautics and Space Administration
Greenbelt, MD 20771
Fax Number: 301-286-0232
E-mail: scott.lambros@gsfc.nasa.gov

GLAST REQUIREMENTS DOCUMENTS

The following two documents are available on the Internet at <http://glast.gsfc.nasa.gov/ao/>.

GLAST Science Requirements Document (March 1999)

This document was written by the GLAST Facility Science Team. It has been accepted by the GLAST Program Office at NASA Headquarters. It specifies the principal science objectives of the GLAST mission and the requirements those objectives place on the GLAST instrument(s).

GLAST Instrument to Spacecraft Interface Requirements Document (Draft)

This document is a product of the GLAST Project Office at the Goddard Space Flight Center. It specifies the technical interface requirements for any instrument proposed as part of a scientific investigation for GLAST.

OFFICE OF SPACE SCIENCE STRATEGIES AND POLICIES

The following documents are available on the Internet at <http://spacescience.nasa.gov/>. Click on “Policies and Publications” or “Education and Public Outreach”.

The Space Science Enterprise Strategic Plan: Origins, Evolution, and Destiny of the Cosmos and Life (November 1997)

This document is a concise statement of the goals and outlook of NASA's Space Science Enterprise. It is a compilation of the major ideas described in more detail in the context of the overall NASA Strategic Plan.

The Evolving Universe: Structure and Evolution of the Universe Roadmap 2000-2020 (April 1997)

This document prioritizes the goals and plans for the Structure and Evolution of the Universe science theme within the Office of Space Science. The Internet site for this document is <http://www.srl.caltech.edu/seus/roadmap/>.

Partners in Education: A Strategy for Integrating Education and Public Outreach into NASA's Space Science Programs (March 1995)

This document describes the overall strategy for integrating education and public outreach into NASA's space science programs.

Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy (October 1996)

This document describes the overall approach to implementing the education and public outreach strategy of the Office of Space Science.

OSS Integrated Technology Strategy (April 1994)

This document describes efforts to manage technology infusion into future space science missions and to promote technology transfer to the private sector.

SPACE SCIENCE SUPPORTING DOCUMENTS

The following document is available on the Internet at <http://www.nas.edu/ssb/tgsaa1.html>

NAS/NRC Report: A New Science Strategy for Space Astronomy and Astrophysics (1997)

Report of the Task Group on Astronomy and Astrophysics. A study undertaken by the Space Science Board to determine the principal scientific issues that the discipline of space science would face during the period 1995-2015.

GLAST RELATED DOCUMENTS

The following document is available on the Internet at http://spacescience.nasa.gov/. Click on "Research Opportunities", "Closed in CY 98".

Gamma Ray Large Area Space Telescope Instrument Technology Development Program, NRA 98-217-02, NASA Office of Space Science, January 16, 1998.

A NASA Research Announcement soliciting advanced technology development for GLAST Large Area Telescope concepts.

GENERAL GUIDELINE AND REQUIREMENTS DOCUMENTS

NPG 7120.5A -- Management of Major System Programs and Projects (November 1993)
This NASA Handbook provides a reference for typical activities, milestones, and products in the development and execution of NASA missions. It can be found on the Internet at <http://Nodis.hq.nasa.gov/Library/Directives/NASA-WIDE/Procedures/Program_Formulation/N_PG_7120_5A.html>

ISO 9000 Series
The following ISO 9000 quality documents describe current national and NASA standards of quality processes and procedures.

- American National Standard, "Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation, and Servicing," ANSI/ASQC Q9001-1994.
- "Quality Management and Quality System Elements - Guidelines," ANSI/ASQC Q9004-1-1994.
- "Quality Management and Quality Assurance Standards - Guidelines for Selection and Use," ANSI/ASQC Q9000-1-1994
- "ISO 9000 and NASA," Code Q presentation, April 24, 1995.

Note: The first three ISO 9000-related documents are copyrighted and cannot be reproduced without appropriate compensation. For copies contact:

American Society for Quality Control (ASQC)
P.O. Box 3066
Milwaukee, WI 53201-3066
800-248-1946

PROCUREMENT-RELATED INFORMATION

Electronic versions only are available for the following:

Federal Acquisition Regulations (FAR) General Services Administration
<http://www.arnet.gov/far/>
NASA FAR Supplement Regulations
<http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm>
NASA Financial Management Manual
<http://www.hq.nasa.gov/fmm/>
NPG 5800.1D -- Grant and Cooperative Agreement Handbook (July 1996)
<http://ec.msfc.nasa.gov/hq/grcover.htm>

RELIABILITY AND QUALITY ASSURANCE, MATERIALS AND EEE PARTS

Office of Flight Assurance, GSFC. URL: <http://arioch.gsfc.nasa.gov/

NASA Standards Documents can be found on the Internet at <http://standards.nasa.gov>

NASA Technical Standard NASA-STD-8739.3, Soldered Electrical Connections

NASA Technical Standard NASA-STD-8739.4, Crimping, Interconnecting Cables, Harnesses, and Wiring.

NAS 5300.4(3J-1), Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies

NASA Technical Standard NASA-STD-8739.7, Electrostatic Discharge Control (Excluding Electrically Initiated Explosive Devices)

NHS 5300.4 (3M), Workmanship Standard for Surface Mount Technology

ANSI/IPC-D-275, Design Standard for Rigid Printed Boards and Rigid Printed Board Assemblies, Class 3

IPC 6011 and IPC 6012, Class 3 as the basic specification requirements with GSFC S-312-P-003B, Procurement Specification for Rigid Printed Wiring Boards for Space Applications and other High Reliability Uses as a supplement.

NASA Technical Standard NASA-STD-8739.5, Fiber Optic Terminations, Cable Assemblies, and Installation

SAFETY

EWR 127-1, “Eastern and Western Range Safety Requirements”. URL: <http://arioch.gsfc.nasa.gov/302/Systy.html>

APPENDIX D

GLAST SCIENTIFIC MANAGEMENT, ORGANIZATION, AND RESPONSIBILITIES

The purpose of this Appendix is to describe the management approach for planning and implementing the GLAST Program and the authority, responsibilities, and interfaces of key participants in the project.

1.0 PROJECT ORGANIZATION

The NASA Goddard Space Flight Center (GSFC) has been designated by the NASA Office of Space Science as the Program/Project Management Center for GLAST.

2.0 PROGRAM/PROJECT PHASING

For planning purposes, the phasing is based on a FY 2000 start for definition activities and a FY 2002 new start for implementation.

Scientific investigations are to be selected in response to this AO and confirmed for implementation as described in Section 6.4.3 of the AO.

After selection for definition, NASA GSFC will contract with the selected Principal Investigator's organizations for the definition activities. During the definition phase, each IPI and his/her team will establish a preliminary design, deliver a prototype based on the preliminary design, support a balloon flight of the prototype (or some other effective means of demonstrating the ability of the instrument to handle the multi-component background encountered in a space flight environment), and update the cost proposal and management plan for the implementation phase.

3.0 DEFINITION

Funding for IPI proposals during the definition phase will be provided by NASA to support the following tasks:

1. Preparation of a preliminary instrument design in sufficient detail to permit verification of interface and support requirements, verify the development cost of the instrument and confirm the ability of the IPI to meet Project milestones. The IPI must demonstrate that she/he has sufficient design data necessary to proceed to the implementation of the instrument.
2. Upgrading of a prototype to fly on a high altitude scientific balloon and the support of that flight, or some other proposed effective means of demonstrating the ability of the instrument to handle the multi-component background encountered in a space flight environment.

3. Preparation of an updated cost proposal.
4. Participation in project meetings such as Project Reviews and Science Working Group meetings.

4.0 Implementation, Flight Operations, and Data Analysis

Authority to proceed to the implementation phase will be given by the NASA Associate Administrator for Space Science. During the implementation phase, NASA's GSFC will fund the IPI's for hardware development, scientific support, preliminary pre-flight data analysis, flight data reduction and analysis, and instrument operations. GSFC will fund the IDS's for final definition of their investigations, IDS support required by NASA, and reduction and analysis of data from their investigations. The following general tasks will be funded during the development phase:

1. Program management, including provision for detailed cost and schedule tracking and reporting.
2. Studies and analyses.
3. Design, development, fabrication, test, calibration and delivery of flight hardware and GSE.
4. Documentation required to enable others to integrate the flight hardware onto the spacecraft.
5. Support of flight operations.
6. Support of data reduction and analysis.
7. Participation in meetings and reviews.

5.0 Science Management Functions

5.1 Project Scientist (PS)

The PS is responsible for maximizing the scientific return from the GLAST within Project constraints. The PS will be the primary point of contact between the IPI, IDS, and the Project on matters of scientific interest on a daily basis. The PS shall work with the GLAST Program Scientist at NASA HQ to ensure that the science selected for this program is carried out. He or she will be responsible for coordinating overall observatory scientific systems, mission operations, data reduction, and analysis. The PS will ensure that the research is conducted with minimum delay, that Guest Observers receive the data they have won in a timely manner, that data are made available to the broader scientific community on the agreed schedule, and that exciting results are disseminated to the public promptly. He/she is chairman of the Science Working Group.

5.2 Instrument Principal Investigator (IPI)

An IPI has full responsibility for the conduct of the selected investigation, including the development, performance, cost, and timely delivery of the instrument and any associated software and documentation required for operation and for analysis of data. The IPI will direct and coordinate instrument development, checkout, calibration, and the reduction and analysis of his or her portion of the flight data and publication of the scientific results. The IPI will have an ongoing responsibility for a period of 30 months after postlaunch checkout to assist in the operation, calibration, and data processing associated with the instrument; to prepare user documentation; to assist other observers in its use; and to assist in the preparation of the data for deposit in a specified archive in a form that is usable by other investigators.

Other specific duties of the IPI include:

1. Allocating work assignments among and managing the activities of the Co-Investigators
2. Ensuring that the design of the instrument is appropriate to the objectives of the investigation; that the environment and interface constraints are met and are compatible with schedules, budgets, system specifications, and standards
3. Participating in planning and executing mission operations
4. Developing and maintaining adequate documentation regarding the investigation
5. Planning and conducting suitable calibration of the science instrumentation
6. Planning and providing suitable means for the reduction and analysis of his portion of flight data on a timely basis consistent with overall GLAST plans and schedules

5.3 Interdisciplinary Scientist (IDS)

The IDS will be responsible for attending reviews and participating in other activities required to assist the GLAST Project in maintaining a broad and critical scientific and technical overview of the GLAST development. IDS will be appointed at the time of selection under this AO and will serve for a period of 30 months after postlaunch checkout.

5.4 Science Working Group (SWG)

The IPI(s)s, the IDS(s), three designated Co-Investigators from the science team of the Large Area Telescope investigation, the GLAST Project Scientist, and the NASA Headquarters Program Scientist (ex officio) will constitute the GLAST Science Working Group (SWG). Up to three additional members of a Large Area Telescope investigation, and up to one additional member of any secondary instrument investigation may be designated as an ex-officio of the SWG if they are the lead member of a contributing partner organization, and if all expenses related to their SWG participation are borne by their organization. The SWG will be chaired by the Project Scientist. The chairperson will serve as the Group's representative in activities not requiring participation by all group members.

The SWG will:

1. Assist the GLAST Project in establishing overall requirements and priorities in support of the mission plan;
2. Assist the GLAST Project in maintaining, updating, and prioritizing the science requirements;
3. Assist the GLAST Project in the definition and development of the calibration, data handling, data reduction, and mission operations systems; and
4. Participate in GLAST Project reviews and meetings to coordinate scientific requirements and to assist the GLAST Project in mission decisions as they relate to scientific objectives.

APPENDIX E

EDUCATION AND PUBLIC OUTREACH

EDUCATION AND PUBLIC OUTREACH PLAN EVALUATION CRITERIA

There are two classes of evaluation criteria against which proposed OSS E/PO activities will be evaluated. The general criteria to be applied to the evaluation of all proposals, which reflect requirements necessary for further consideration of a proposal, are:

1. The quality, scope, and realism of the proposed E/PO program including the adequacy, appropriateness, and realism of the proposed budget;
2. The capability and commitment of the proposer and the proposer's team and the direct involvement of one or more science team members in overseeing and carrying out the proposed E/PO program;
3. The establishment or continuation of effective partnerships with institutions and/or personnel in the fields of education and/or public outreach as the basis for and an integral element of the proposed E/PO program; and
4. The adequacy of plans for evaluating the effectiveness and impact of the proposed education/outreach activity.

To ensure that the goals and objectives of the OSS E/PO strategy are realized in practice, proposals will also be evaluated using the following specific criteria. Based on the funding guidelines given in Sections 4.3 and 4.6.1, the E/PO elements of proposals submitted in response to this AO may involve the expenditure of substantial resources. Therefore, it is expected that proposed programs will have a breadth and depth commensurate with these resources. Such programs are expected to be multifaceted in nature; address a number of different aspects of education and outreach contained in the specific criteria; and have state, regional, or national scope. The specific criteria are:

1. For proposals dealing directly with or strongly affecting the formal education system (e.g., through teacher workshops or student programs carried out at informal education institutions such as science museums and planetariums), the degree to which the proposed E/PO effort is aligned with and linked to nationally recognized and endorsed education reform efforts and/or reform efforts at the state or local levels;
2. The degree to which the proposed E/PO effort contributes to the training of, involvement in, and broad understanding of science and technology by underserved and/or underutilized groups; and
3. The potential for the proposed E/PO activity to expand its scope by having an impact beyond the direct beneficiaries, reaching large audiences, being suitable for replication or broad dissemination, or drawing on resources beyond those directly requested in the proposal.

Although creativity and innovation are certainly encouraged, note that neither of these sets of criteria focuses on the originality of the proposed effort. Instead, NASA seeks assurance that the proposer is personally committed to the E/PO effort and the PI and/or appropriate research team members will actively be involved in carrying out a meaningful, effective, credible, and appropriate E/PO activity; that such an activity has been planned and will be executed; and that the proposed investment of resources will make a significant contribution toward meeting OSS E/PO plans and objectives.

To aid proposers in the preparation of their proposals, as well as to ensure that reviews are carried out on a consistent basis aligned with the OSS Education Strategy and Implementation Plan, an "Explanatory Guide" to the E/PO evaluation criteria has been prepared and may be found by linking through *Education and Public Outreach* at Internet URL http://spacescience.nasa.gov/.

ASSISTANCE FOR THE PREPARATION OF EDUCATION AND PUBLIC OUTREACH PROPOSALS

NASA OSS has established a nation-wide infrastructure of space science education/outreach groups whose purpose is to directly aid space science investigators in identifying and developing high quality E/PO opportunities. This infrastructure provides the coordination, background, and linkages for fostering partnerships between the space science and E/PO communities, and the services needed to establish and maintain a vital national, coordinated, long-term OSS E/PO program. Of particular interest to proposers to this AO are two elements of this system (which are also described in more detail in the OSS education/outreach implementation plan referred to above):

1. Four OSS science theme-oriented E/PO "Forums" to help orchestrate and organize in a comprehensive way the education/outreach aspects of OSS space science missions and research programs, and provide both the space science and education communities with ready access to relevant E/PO programs and products; and
2. Five regional E/PO "Broker/Facilitators" to search out and establish high leverage opportunities, arrange alliances between educators and OSS-supported scientists, and help scientists turn results from space science missions and programs into educationally-appropriate activities suitable for regional and/or national dissemination

Prospective proposers are strongly encouraged to make use of these groups to help identify suitable E/PO opportunities and arrange appropriate alliances. Proposers should be careful to note that these Forums and Broker/Facilitators have been established to provide help, but the responsibility for actually developing the E/PO program and writing the proposal is that of the proposer. Points of contact and addresses for all of these E/PO Forums and Broker/Facilitators may be found by opening "Education and Public Outreach" from the menu of the OSS homepage at <http://spacescience.nasa.gov/>.

The E/PO proposal must include the following parts: a brief abstract of the proposed activity; an expanded description of the E/PO objectives and planned activities; a description of the intended involvement of the Principal Investigator and/or key science team members in the proposed E/PO effort; a description of any educational personnel who are involved in the effort, including proposed partnership institutions (together with specific indicators of commitment on the part of partners where appropriate); a description of how the effort will be managed; and a brief explanation of the requested E/PO budget. Note that the PI or one of the science team members of the parent research proposal must have the prime responsibility for overseeing the implementation of the proposed E/PO activity. The responsible individual should be clearly identified in the E/PO proposal.

The period of performance of an E/PO activity is generally expected to coincide with that of the instrument investigation proposal throughout all phases of the investigation including the data analysis phase.

APPENDIX F

REGULATIONS GOVERNING THE PROCUREMENT OF FOREIGN GOODS OR SERVICES

The following Federal Acquisition Regulation (FAR) clauses cover the purchase of foreign goods and services and may be included in contracts resulting from this Announcement of Opportunity:

52.225-3 Buy American Act -- Supplies (January 1994)

52.225-7 Balance of Payments Program (April 1984)

52.225-9 Buy American Act -- Trade Agreements -- Balance of Payments Program (January 1994)

52.225-10 Duty-Free Entry (April 1984)

52.225-11 Restrictions on Certain Foreign Purchases (May 1992)

52.225-17 Buy American Act -- Supplies Under European Community Agreement (May 1995)

52.225-18 European Community Sanction for End Products (May 1995)

52.225-19 European Community Sanction for Services (May 1995)

52.225-21 Buy American Act -- North American Free Trade Agreement Implementation Act -- Balance of Payments Program (January 1994)

The proposer is directed to the Federal Acquisition Regulation and the NASA FAR Supplement for further information on these regulations. Access information for these documents is given in the GLAST Bibliography (see Appendix C).

APPENDIX G

CERTIFICATIONS

The following pages contain, for reference only, copies of the three currently required Certifications. Note that the signature of the Authorizing Institutional Representative on the Cover Page submitted with the proposal now verifies that the proposing organization complies with these Certifications; therefore, these Certifications do not have to be independently signed and submitted as in previous Announcements of Opportunity.

Certification Regarding Debarment, Suspension, and Other Responsibility Matters

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 34 CFR Part 85, Section 85.510, Participant's responsibilities. The regulations were published as Part VII of the May 26, 1988 Federal Register (pages 19160-19211).

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
   (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
   (b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statues or commission of embezzlement theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
   (c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
   (d) Have not within three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Certification Regarding Lobbying

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000, and not more than $100,000 for each such failure.

Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs

The *(Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant ")* hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1962 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognized and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.

NASA Form 1206